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IN TWO PARTS

PART ONE

ARCHITECTURAL DESIGN

APRIL

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PART TWO—ARCHITECTURAL ENGINEERING AND BUSINESS

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THE
ARCHITECTURAL
FORUM

VOLUME L NUMBER FOUR

APRIL 1929

√NEW AMSTERDAM AND ITS HINTERLAND

TEXT AND DRAWINGS BY

FRANK A. WALLIS

THOSE sturdy people who ventured across the sea to America, that they might settle and live in accordance with their most cherished ideals, quite unwaveringly subscribed to Cicero the ancient when he expressed the thought that, "the chief thing in an art is that what you do shall be befitting." They desired to manifest more of the thing which they recognized as the art of living, and this just as they saw it. Fleeing from the religious intolerance of their motherland, and intent on establishing a more hopeful future in America, the land of freedom and promise, the first company of Dutch settlers arrived on the ship "New Netherland" in 1623. According to Jackson, there were nearly 30 families on this voyage, the majority being Walloons; some landed at New Amsterdam while the remainder sailed farther south to the region of Delaware. Upon the arrival in New Amsterdam of these wayfarers, their thoughts were immediately diverted from unpleasant voyaging to the erection of suitable homes. Conditions as they found them were very difficult, to say the least. There were a great many hardships to be endured. These pioneers had to live and build, and to that end they worked unceasingly, doing the best that circumstances would permit. From the very inception of this settlement, which was destined to become the great metropolis of New York, when a bartering post and protective stockade had been built on the southern end of the island, and directly on through the entire colonization period until after the War of 1812, our ancestors seem to have possessed an extraordinarily keen understanding of appropriate home building. Obviously enough, the log cabin was the first form of building. Regular-sized timbers, siding and even shingles later made their appearance with the advent of the sawmill, but in the scramble for shelter there was but little time for æsthetic consideration. Whole villages of these cabins were put up within the limits of stout stockades, for the Indians were not always friendly with the whites who came to settle on their shores. Albeit the natives received something for their lands, there were shortcomings here and there. Large tracts of virgin forests had to be cut and the land cultivated. Spinning wheels and looms were brought out to manufacture clothing. As families grew larger and the population increased, there appeared small houses of worship. Step by step, living conditions grew more improved and comfortable; better and more durable homesteads were built, but always with simplicity as the watchword. Building materials as well as facilities were more unlimited and less static. Homes with more beauty and charm came into being, but always built with practical adaptability to serve their particular requirements. In short, these settlers were a valorous and industrious people with honest activities carrying them constantly forward. Thus, with such endeavor and sense of the fitness of things, the resultant blessing was well earned prosperity. Of such was moulded the character of the early colonists, and out of all this there was to grow our eighteenth century architecture, with all its great influence.

Today, after the march of years has mellowed the pristine charm of such of these delightful old homesteads as still exist, they seem ever to be increasing in value as splendid inspiration for the modern country house architect. Availing oneself of their lure, some of these attractive old houses might suggest a fascinating pilgrimage, starting in New York, where a number of fine old examples that have escaped the hand of "progress" are still struggling to live in the shadows of some none too beautiful skyscrapers. Journeying northward on the old Boston Post Road as far as

"OLD CANNON BALL HOUSE," RIDGEFIELD, CONN.

HAWLEY HOMESTEAD, RIDGEFIELD, CONN.

the quaint little village of Bedford, and thence a little farther on, one comes to Ridgefield, the immaculate, located just across the state line in the borderland of Connecticut. This pleasant pilgrimage, covering but one or two of the many important colonization points along the seaboard and its various hinterlands, would lead away from the hubbub of a tumultuous city to more unbeaten paths where there still exists some of the flavor of America's old time life and rural architecture and to a storied countryside that will ever be interesting and colorful. Any attempt here to dwell at great length either on any particular homestead or the houses generally would be hardly possible; however, let this suffice to reflect but a bit of the incomparable pleasure of settling oneself down into the atmosphere of some excellent types of century-old houses,—a few of those still standing.

While there are certain similarities in the general character of the various influences in eighteenth and early nineteenth century work on Manhattan Island and the immediate vicinity, there are distinct variations that tend to make comparison both interesting and worth while. One of the most important homesteads built before the Revolution in New York, and one that is perhaps more colorful than others in its storied and historic past, is the Roger Morris house on Harlem Heights. From the day in 1765 when the original house was about completed, up to the early part of the nineteenth century when Stephen Jumel came into possession of it, this farmhouse had been the scene of a heterogeneous train of events, two of which were its occupation by General Washington and likewise by the British forces. After taking over the building in 1810, Jumel, who, by the way, was a wealthy French merchant, set diligently about the task of restoration. Only after punctilious effort and tremendous expenditures,—for neglect had left ugly scars,—was the place once more in order. The house now stands, fairly well preserved, as one of New York's most interesting historic monuments. This beautiful building, with its elegant portico and general refinement of detail, has served well to attract the present-day designer. In the past there has been rather lengthy discussion as to whether the two-story portico was part of the original conception or something added in later years. An exceptionally beautiful doorway on the front and a finely proportioned door on the west elevation are of special interest. An attractive feature of the plan is the wide hall, forming an axis from front to rear of the house, with large high-ceiled and well lighted rooms on each side. A delicate and restrained doorway, leading from the pantry to the east side of the house, is not a part of the first composition but came when the place was restored. Then, too, there are fine arrangement and combination of wood quoining and flush-jointed boarding, all of which help to make the old house the more unusual and interesting architecturally.

The Dyckman house, at Broadway and 204th Street, is another homestead that eloquently bespeaks the simplicity characteristic of our early Dutch builders. Though this house was not built until after the Revolution,—in 1783 to be more exact,—it bears much of the character of, and might easily be mistaken for, one of more ancient years. The wing is of earlier date than the main mass, and it is quite possible that it somewhat resembles a similar part of the original Dyckman house that was built about 1667 and destroyed in the struggle that followed over a century later. In the homestead, as we find it today, simplicity is everywhere apparent, even to the combinations of the various materials and textures. Recently the house has been carefully restored by members of the Dyckman family who, by the way, were still the owners, and it is through their kindness that the interiors, furnished correctly, or much as they were in the early days of the house, are opened to an appreciative visiting public.

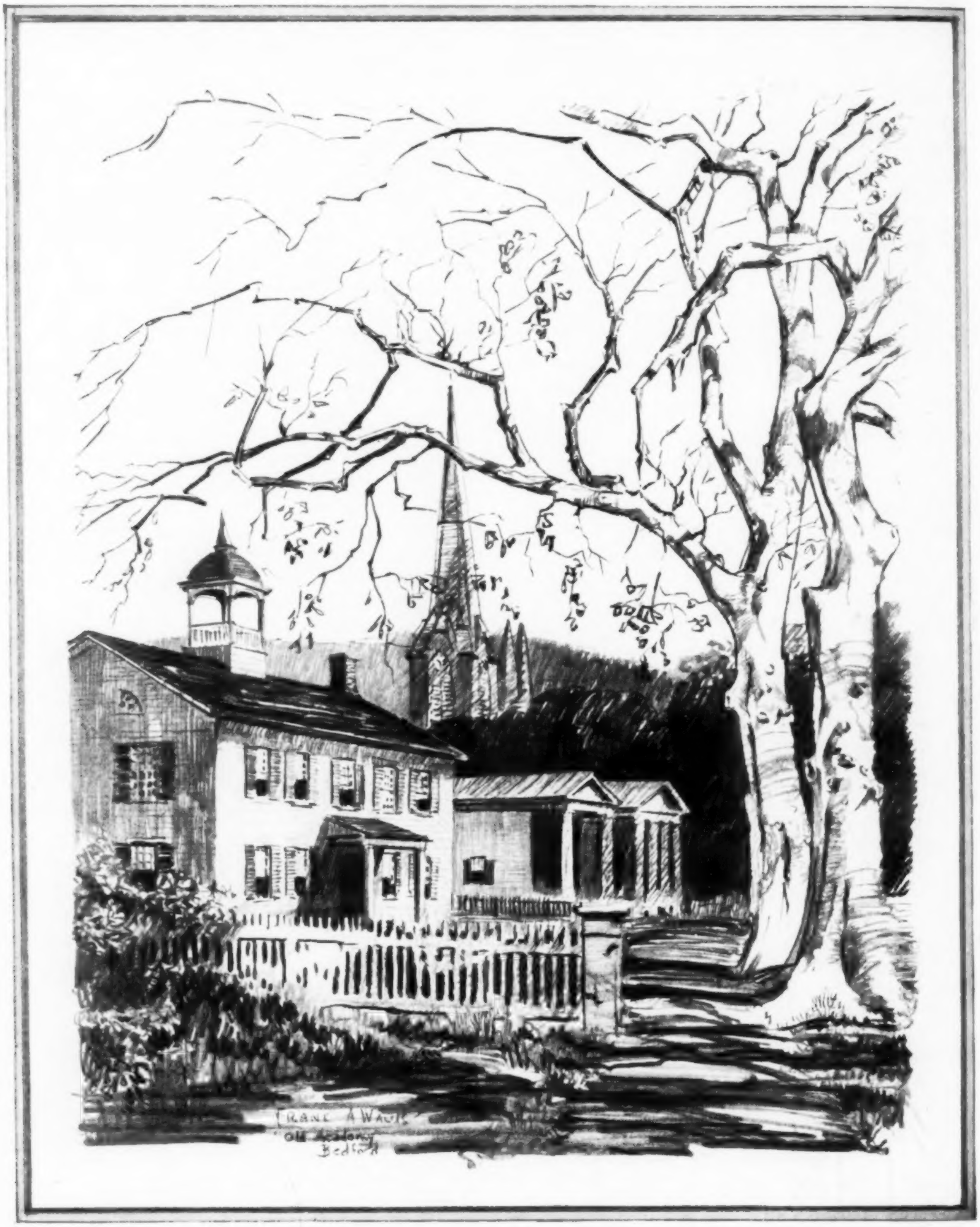
Alexander Hamilton's "Grange," it is recorded, was built in 1801, when, after experiencing a political reverse, the beloved statesman decided to become a gentleman farmer. Unfortunately, however, his plans were abruptly terminated by the tragic episode which followed his duel with Aaron Burr. Hamilton was a keen, discriminating individual, and needless to say his very superior taste was reflected in the home where he meant to spend his remaining years. The Van Cortlandt house, and likewise the Gracie mansion are two other homes of long-ago New York, which have a distinctive air about them. The later place, with a commanding view, is situated in Carl Schurz Park on the East River. On seeing this place today one appreciates its lordly position, from whence the original owner could see for miles up and down not only the East River and far out on Long Island, but the mighty Hudson as well. The house is of the square type with excellent taste shown in its imposing proportions and simple details. The north side is graced by the presence of a splendid late Colonial doorway. The Van Cortlandt house in the park bearing the same name was built by Frederick Van Cortlandt about 1750. There is a feeling of dignity to the general mass of this building, and the arrangement of the windows as well as the designing of the lesser details is well considered and happy. Both on the exterior and within, there is felt the extremely definite influence of the early Georgian era. The tiny "Poe cottage" on Kingsbridge Road, implanted among some taller and more or less un-

gainly neighbors, is of more recent date, perhaps, but none the less delightful. No more adequate description could be made, perchance, than to quote,—"so neat, so poor, so unfurnished and yet so charming a dwelling I never saw." There are some, but not many, other homesteads of early Manhattan that have managed to escape the monster called "property value," which is apparently, completely devoid of any architectural reverence or appreciation.

Following the road that leads up to and beyond the east side of Kensico Dam, once again we experience the spell of Westchester's bewitching beauty. A few miles farther on and just before entering Bedford, there is certain enchantment in the fresh looking countryside with its verdant hills rolling away to the grayish pinks on the horizon. This country has a resemblance to Normandy and to many parts of England, and we can readily feel the simplicity of it that was so attractive to our ancestors. Bedford, the tranquil, near yet far away from the haste and bustle of a large metropolis! What a pleasant relief and contrast for city-weary eyes! It is named after the town in Bedfordshire, England, from whence came its early settlers. Etymologically, the name comes down from the Saxon as "Bedanpond,"—"more eminent," Camden explains, "for the pleasantness of its situation and its antiquity, than for either beauty or largeness." The village is charmingly situated a little north of the Old Mehanas River, the picturesque banks of which were the favorite stamping grounds for several tribes of Indians, presided over by Catoonah, the sachem. It was along these fertile shores that, in the earliest days, a vast growth of hops was found, which apparently figured, in name at least, in the sale of this and adjacent acreage. Ancient records prove that the "hop ground" purchase consisted of a grant of 7,700 acres of this desirable locality, which Catoonah gave to the settlers in exchange for, according to the bill of sale, "twelve indian coats, six blankets, 300 gilders wampan, two yard red cloth, six yard red coton and more by expenses," the total value of which ran in the neighborhood of some £46. To be sure, a good bargain! Catoonah and his several business associates, "doe bargen and hereby grant," the deed read on, "full liberty of timber and herbedge for them and theire creatures upon our aincent lands for euer and doe hereby acknowledge to have received satisfaction for the land above." Commissure Robert Law affixed his hand to this grant under the date of December 23, 1680, and it is assumed that the settlement was well under way by this time, though it was not until a year or two later that Bedford officially received its name through a general court order, thus establishing the settlement and giving it a permanent and legal status.

Not unlike many other colonies in the war area, Bedford was, for no good reason, destroyed by fire on July 2, 1779, when a band of British soldiers under Colonel Banastre Tarleton was making its way to Fairfield, Conn. Consequently, those houses that were immediately rebuilt are dated from this period. One's first impression of this fair town, with its aged elms arching the roadways, is of the quiet and irresistible beauty of many of its century-old homesteads. They have a manner full of silent grandeur and dignity, but in no wise are they pretentious. This may be attributed to the detail, that is always refined and convincing. On either hand of the village green, we find house after house of that fine order, peacefully standing in the cool shadows of mighty elms or sycamores, whose thick foliage often permits tracery of sunlight to describe delicate designs on their snow-white facades. Two or three tiny but finely balanced temples bear marks of the classic revival, but for the most part the houses are more domesticated buildings. The old "Academy," now used as a library, has a very flat gable roof. Its well placed fenestration and excellent doorway lend a compelling atmosphere to this house. The court house, dating back to 1787, is a gambrel roof affair, which like the Academy, is pleasingly surmounted by a fine belfry. Windows have been replaced here and there by the common or garden variety, but most of the original 12-light sash are still in evidence. On the green there may be found a perfectly enchanting little building that is known as the "Bedford Museum." The walls of this minute place are built entirely of stone that runs all the way up the low gable to the soffit of the overhang. This stonework, delicately pointed and superb in color, is one of the finest examples of stone masonry to be found anywhere. Around Bedford there are many other old farmhouses, and their appurtenances, such as delightful little smokehouses, woodsheds and the like, command our admiration today, and one feels instinctively that as long as they continue to exist, they will suggest a befitting and unstilted art of another day,—a manner entirely devoid of affectation.

The earliest known inhabitants of Ridgefield were the Ramapo Indians who also came under the authority of Catoonah, the high chief. To them, this vast section of unbroken country that was to become Ridgefield, was called "Caudatowa," meaning "highland." This was significant in itself, but more appropriate was the name "Ridgefield," because of the several ridges running through the town from whence one might have a lordly view of the surrounding country. The town began settling in the last years of the seventeenth century, though it was not until Sep-



THE OLD ACADEMY, BEDFORD, N. Y.

A SMOKEHOUSE, BEDFORD, N. Y.

tember of 1708 that the town deed was given to seal the agreement between Catoonah and the white settlers. He disposed of some 20,000 acres in consideration for approximately £100. It was cash now,—obviously Catoonah was doing a land office business, but everybody concerned seemed quite satisfied with the transaction,—even Queen Anne, who some six years later issued her official indorsement of the patent. The early towns people of Ridgefield were a thrifty, unassuming lot, and each member of the colony was quite ready to lend a helping hand to his neighbor. There was no trace of grandiloquence here, no bombastic qualities either in their living or their architecture, but they harmoniously worked in all things to promote the growth of the town; to them it was their work, their play and their "art . . . in which the hand, the head and the heart go together." In the stirring spring days of 1777, Ridgefield was the scene of a fierce clash between some 600 Americans and the malignant Tryon, the last royal governor of New York, and lately commissioned colonel in His Majesty's army. But in due course the war ended, and the village once more settled back into its more becoming attitude of peace and progress. That the town kept expanding is evidenced in the voted ruling that "Horses, neat cattle, mules, swine and geese shall be prohibited from running at large on the Highways or Commons of this town."

It is with keen pleasure that one visits Ridgefield today. Everywhere in the town and in one form or other, there may be seen the carved pineapple, which throughout the eighteenth century, was known as the symbol of hospitality. Here one feels an unmistakable crispness and cleanliness,—a flavor of fine character permeating the entire town. The old Keeler Tavern (1787), at present owned by Cass Gilbert, is one of the most attractive buildings in Ridgefield. The main part of the house has a gambrel roof of very graceful slopes, surmounted by a delicate railing. The small gabled wing is unusually well designed and falls into the composition especially well, forming one of the house's distinctive features. The place possesses further architectural distinction, marked by uncommon yet simple details such as porch columns, seats, well-head, etc., all of which lend individual charm. Often since the Revolutionary days, this erstwhile tavern has been called the "Old Cannon Ball House," for the reason that embedded in one of its heavy timbers, is a shot which undoubtedly had a more violent purpose. The ball has been left there as a lasting memorial to its more strenuous days. This tavern was a gathering place for Ridgefield's parties and other social functions, and it likewise was a favorite stopping place on the old New York to Boston stage coach line, where travelers and horses could be refreshed and put up for the night. There still stand a number of interesting examples of the early work; among the best is the neat little cottage built by Rev. Thomas Hawley in 1713. Since its date goes back that far, it is easily the most ancient building in the town. This house has the cornice line just high enough to make the width of the facade quite convincing. The gambrel roof has three closely cropped dormers, each containing the period's 12-light sash. The dormers may have been built in later years, however; be that true or otherwise, they add a large share of charm to the entire design. There are extremely fine proportions in the windows on the first floor, and the green shutters with their very narrow side stiles are particularly delightful. The little entrance porch strikes a jolly note that could not be overlooked. Today this house is well preserved and cordially invites architectural investigation. There are other old homesteads in Ridgefield that come in for a generous share of interest and attraction, though in some cases one regrets the evidence of suffering due to later "finery" such as indifferent types of doorways, porches, bay windows, etc.,—evidences of architectural hysteria which everlastingly come under the head of "modern improvement." These houses may be added to with a reasonable amount of good taste, but it is decidedly unfortunate where mistakes have been made, mistakes which often ruin them.

Perhaps there will be, sometime in the future, newer modes and impulses to influence our domestic architecture; there may come fresher conceptions in styles that are far different from anything we have ever had, but for the time being the modern American architect has but little precedent of more vital importance than the variety of suggestion and inspiration handed down by our builders of other years. These fine old exemplars have survived the test of many decades, and some will continue to live for years to come. One cannot help but admit that Sir Christopher Wren caught hold of one of the underlying realities of building when he said "Architecture aims at Eternity."

Editor's Note. Seeing Bedford and enjoying its charm and beauty, one wonders how long either beauty or charm may endure. Mention has already been made of the Dyckman homestead, surrounded now by cheap and ugly apartment structures, and to the Gracie mansion, which seems destined to be hemmed in by buildings of a better order but still hardly calculated to enhance the charm of the old homestead, while the Van Cortlandt house is even now protected only by its broad acres which form a public park. May the Fates be kind to Bedford and Ridgefield, and long may they last to inspire architects and home builders and to lead in advancing good taste.

THE MUSEUM, BEDFORD, N. Y.

Photo. Bonney

CHURCH AT HILVERSUM, HOLLAND
D. A. VAN ZANTEN, ARCHITECT

SOME MODERN EUROPEAN CHURCHES

BY

MILTON D. LOWENSTEIN

MUCH of the church architecture of the nineteenth century and of that of the early years of the twentieth abounded with ambiguous detail along with a close adherence to precedent, —an adherence in fact which was so close that it left little opportunity for originality and afforded none whatever to inspiration. The World War left its mark upon every department of life and has influenced the development of every form of art. It has been said that it brought self confidence to the victors, grim pessimism to the vanquished, while neutrals have gained something of the advantages which have accrued to both victor and vanquished, without having had to accept the disadvantages which the war brought to either.

Possibly because it is so readily observed by all observers, the influence of the period upon architecture seems to have been more marked and more striking than that made upon art in any other field. The leaven of a new age is vigorously at work, and old forms are being discarded as outworn and out of date, to be replaced by other forms new and highly spectacular,—at times even grotesque. Every country of northern Europe is developing anew its distinctive architectural forms, and the student of architecture may observe the development of each national type and note what might be called the animating spirit of each. Particularly interesting seems to be the development of German architecture during the past decade. From the anticipation of conquest bewildering in its magnitude, the German people were cast down to the most abject defeat. What then more natural and more logical, when the first period of realization was over, than that Germany should set to work to build a new structure,—new spiritually as well as politically,—and that the new should by its very form strive to render its garb as different as possible from what had been known before? Architecture, like art of every form, has high spiritual qualities, and its very functions render these qualities conspicuous. To architecture, therefore, has fallen the office of expressing most audibly to the modern world the present state of German art.

The modern church has succeeded in uniting many of the diverse elements of a complex social organization. It is only when this contrast and contiguity exist that we are sure we are beholding artistic worth. Von Ogden Vogt, writing of the artist in general, said: "As a man and a citizen he is required to stand apart and to be an onlooker. I believe that it makes a profound difference as to which is the real self of the artist and which is his assumed dramatic role. If his real self is the spectator, and he merely makes dramatic excursions into real life, I think his art will be bad art. If his real self is a man and a citizen, and he makes the supremely dramatic effort of imaginative withdrawal, I think his art will be good art."

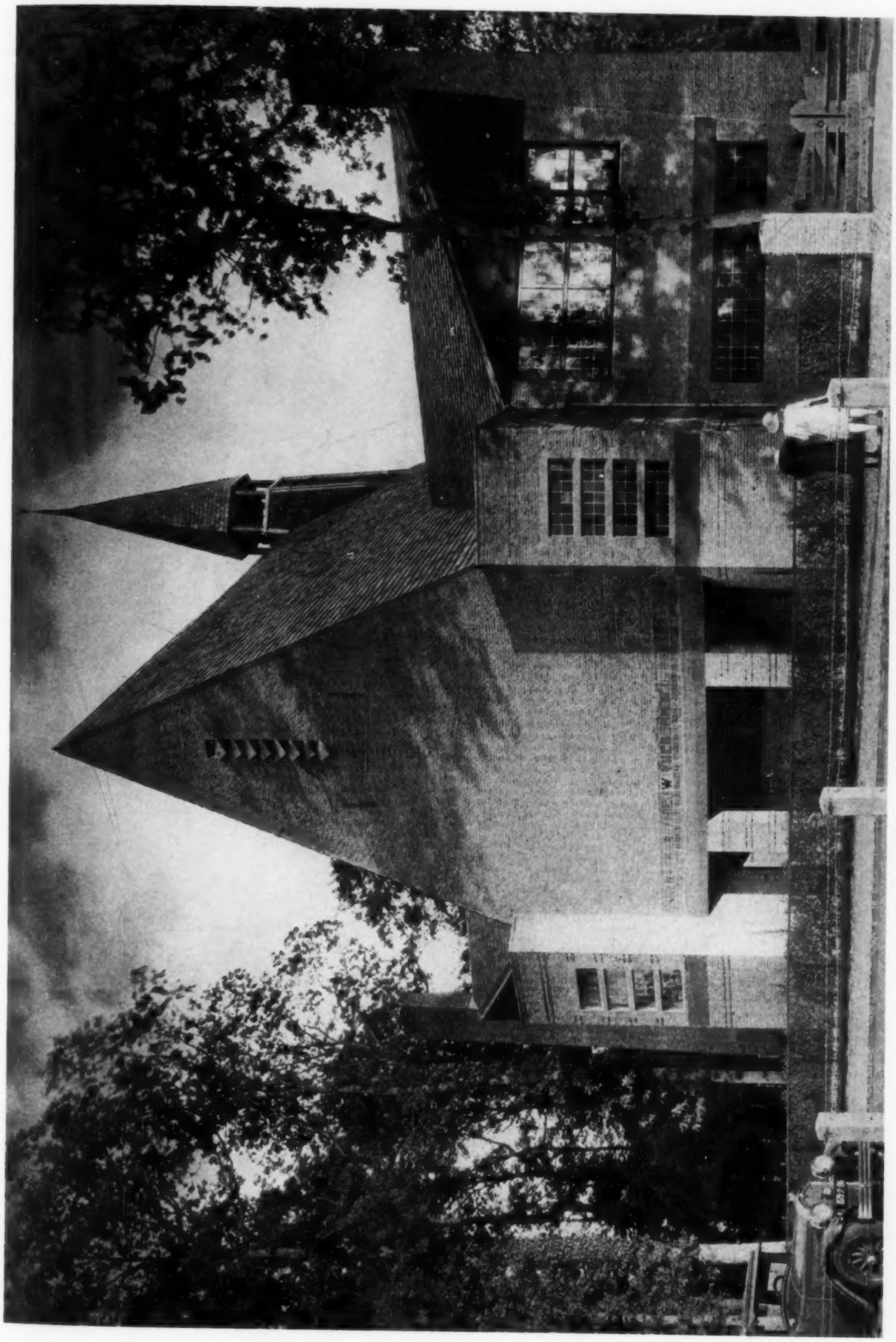
The accompanying illustrations of a few of the recently completed European churches may be studied to advantage. The church on Tempelhofer Field, Berlin, typifies the form of the material employed in its wall. But how genuinely sincere is the dispostion of the masses! Solids, voids and reveals are combined with a just appreciation of all the practical ends desired. The roof, which in the meanest German building is always an ennobling feature, attains a perfect balance in this church. There are compromises in the building's austerity, but except for the interior of the vault where the architect succumbs to the temptation offered by the great expanse of material, the deviations are necessary to accentuate the dominant truth. The northern love of material for its own sake is tempered in the Scandinavian countries by a pride in local tradition. Religion to be religion must bear the same relation to the Scandinavian as it did to his mediæval ancestor. His spirit has not changed except in that it has adapted itself to a larger group. The church to be adequate must express wide influence. Architectonically, it must take account of the national highly colored imagination and an elf-like piquancy in character, which has been much suppressed by contemporary civilization. One is allowed a glimpse into this hinterland of the spirit in the creation of the architect, Jensen-Klint. The tower of the Grundtvig Church fairly aches for the voice of some leader who will unite Earth to a stranger Heaven. More chaste, yet not less significant are the towers of Hogalid's Church in Stockholm. To hold a simple gabled facade between two octagonal towers that extend straight up from the ground without keeping them aloof or cramping the building was a problem solved by an eye long accustomed to exercising good judgment and immune to petty artifices. No intermediary breaks, offsets or string courses are employed, but the right proportions of the principal elements themselves constitute a unity. The doorway by itself is a sturdy conception with perhaps too great an insistence of logic in the details. Its consistency with the entire facade cannot be judged from the illustration where the doorway is screened. The interior is

Photos. Sigurd Fischer

First Church of Christ, Scientist, The Hague
H. P. Berlage, Architect

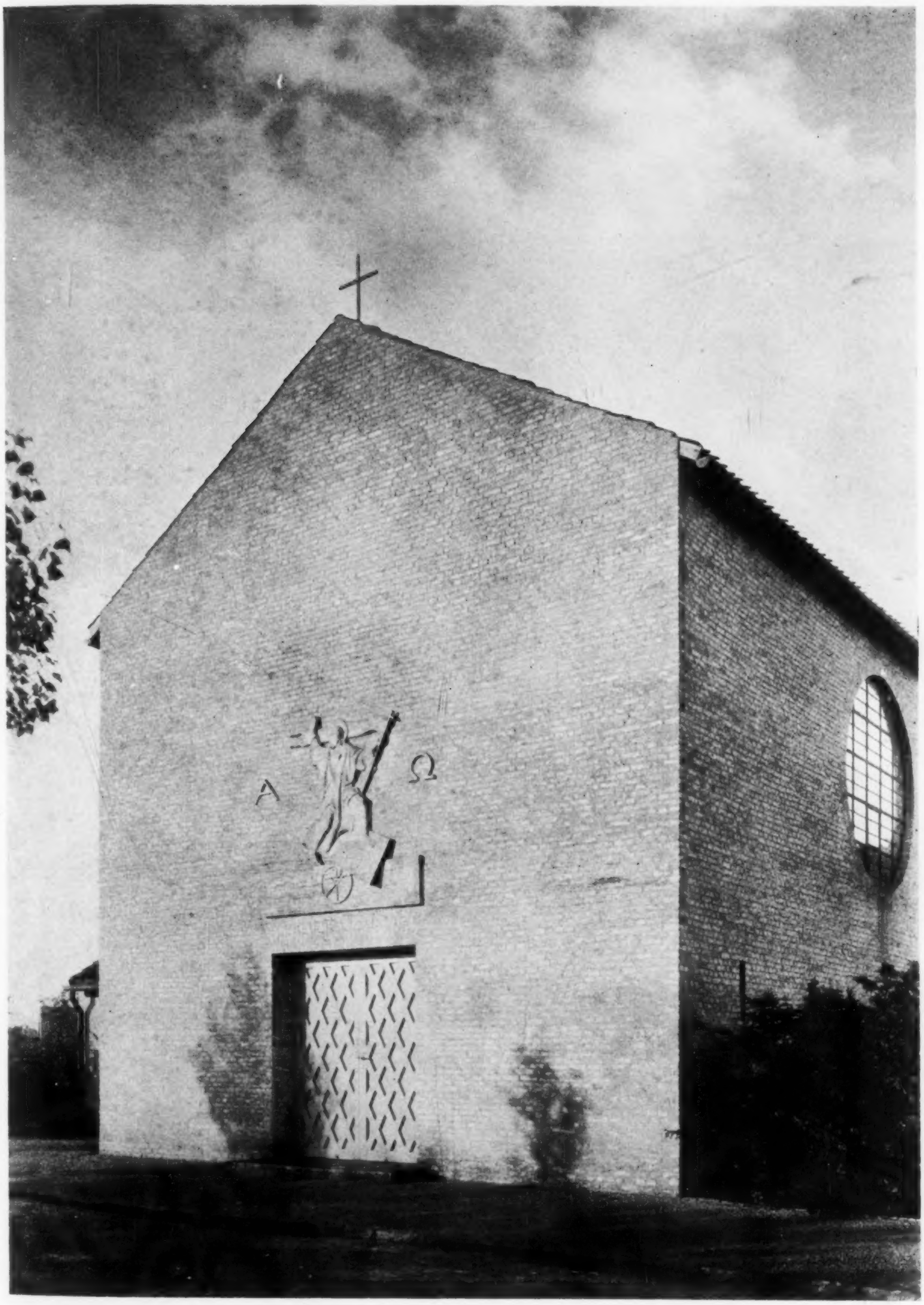
cold and terribly reasonable, but like the golden snake upon which the stricken Israelites had to gaze in order to free themselves of the vipers, the church's frigidity ought to unshackle the self-conscious beholder. The two examples from Holland show the influence of men who have been able to raise themselves above many transient cares in order to suggest some solution to their less fortunate compatriots. To the unpracticed American eye these unpretentious structures are too barn-like to be taken seriously. But, on the contrary, they were created by men whose knowledge of their material and its purpose precluded any longing for academic "style." This kind of art is alive, and like warfare, it leaves to posterity the problem of finding an historical *raison d'etre*. That it be synchronous with contemporary life is all we may ask of art; great art may do more, but the privilege of finding the tradition of the present must be left to posterity. In the works of Delorme we find traces of that decadence which characterizes the downfall of the so-called Gothic style. He is beginning to love his material without regard to the purpose it serves. The artist must maintain the sensitivity of his spirit as well as the facility of his physical powers. "The sounding board which vibrates in us is our criterion of harmony," writes the French architect, Le Corbusier. "This is indeed the axis on which man is organized in perfect accord with nature and probably with the universe, this axis of organization, which must be that on which all phenomena and all objects of nature are based; this axis leads us to assume a unity of conduct in the universe and to admit a single will behind it."

Editor's Note. The spirit of freedom which has entered into a great deal of contemporary European architecture has not been confined to public, commercial, institutional or domestic buildings. This new expression has evidenced itself quite as much in ecclesiastical architecture. People who find it difficult to understand, or be sympathetic to, the new architectural expression will undoubtedly find it difficult to reconcile themselves to a type of church architecture in which there is very little suggestion of the influence of precedent. In ecclesiastical architecture, perhaps more than in any other, some adherence to the architecture of the past is still demanded by most people. However, as a record of current architectural design in Europe it is reasonable and justifiable to publish these interesting churches.

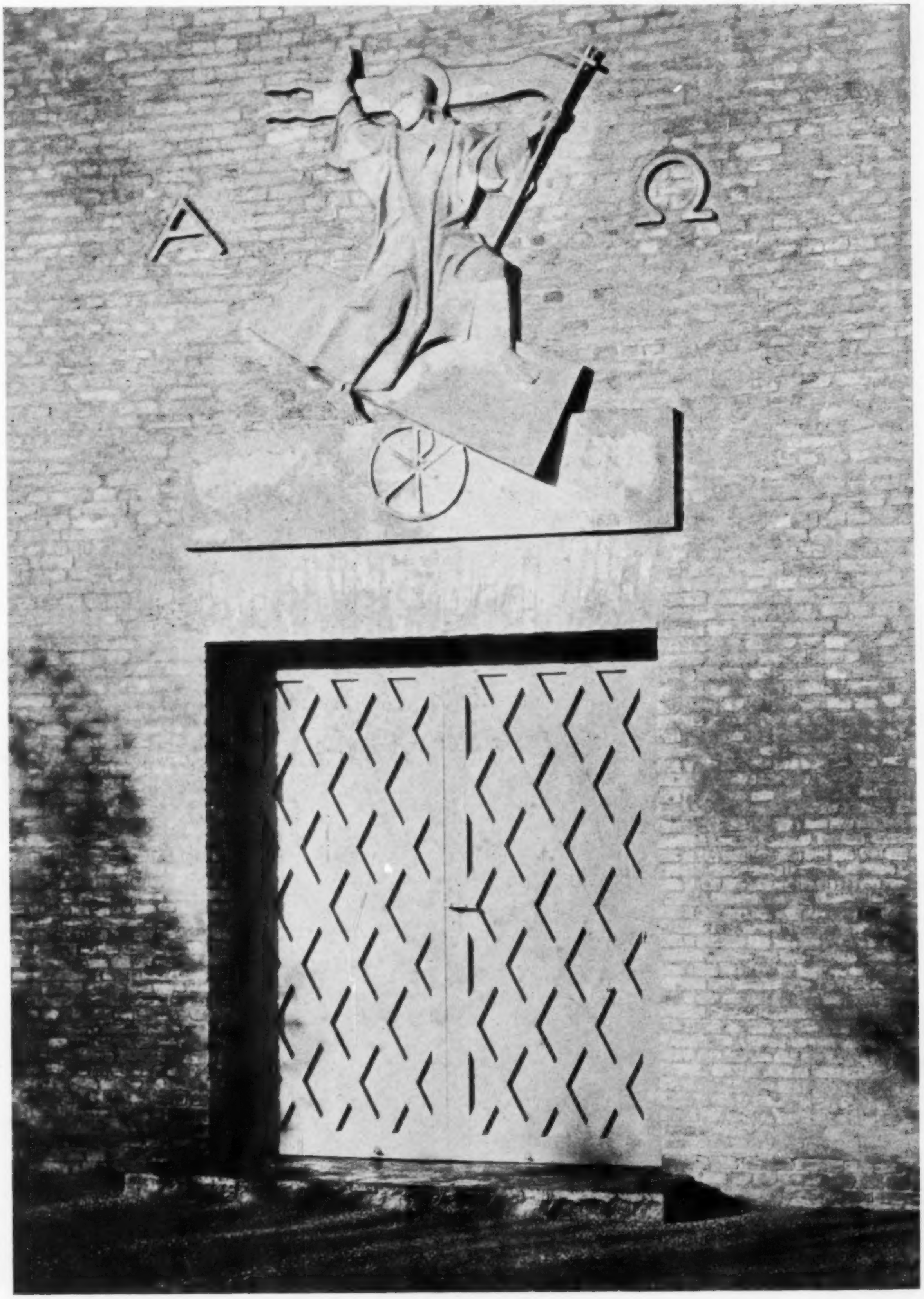


NIEUW VREDENHOF CHAPEL, HAARLEM
H. KORRINGA, ARCHITECT

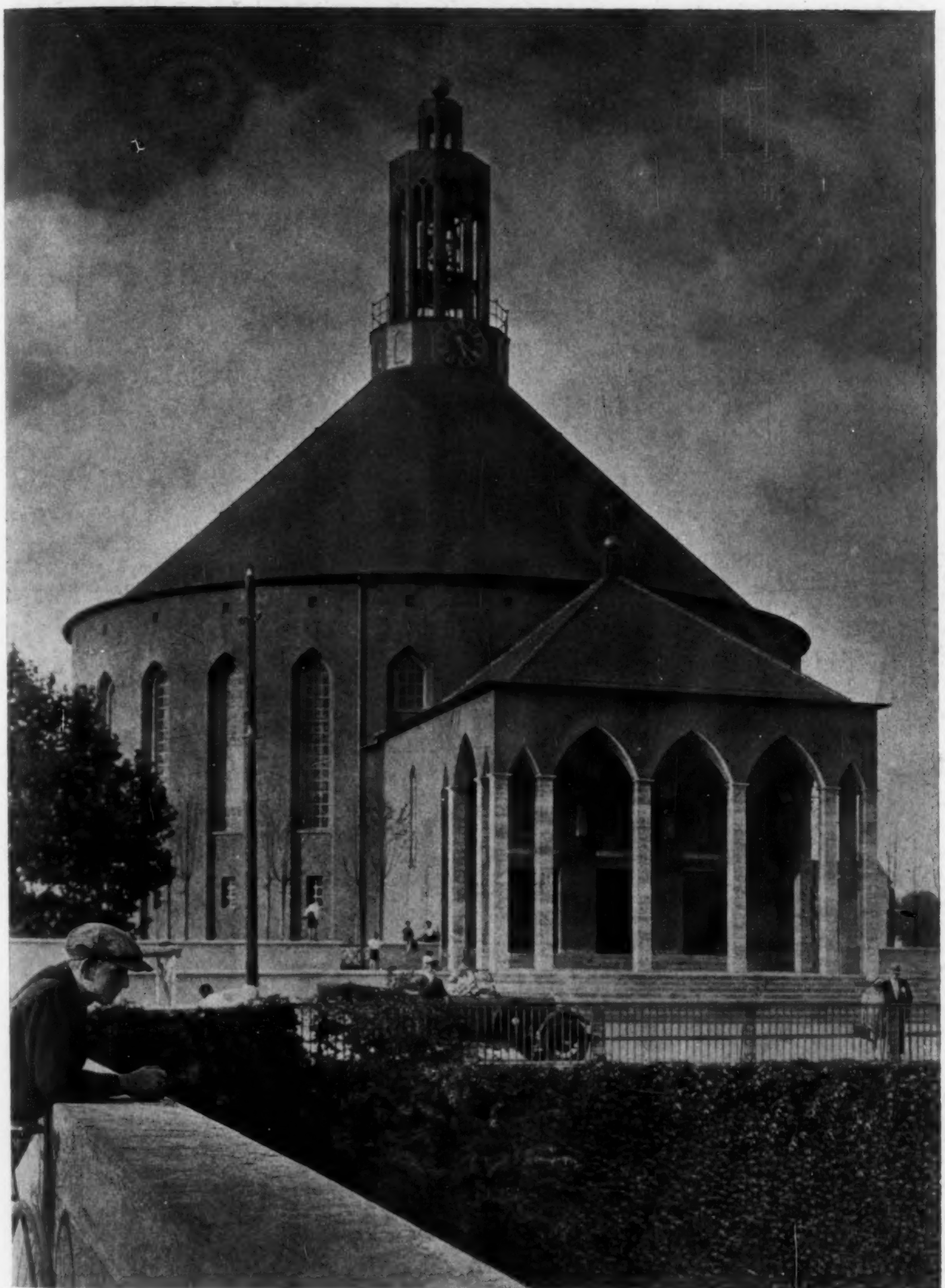
OLD COUNTRY CHURCH, TIBIRKE, DENMARK



CHAPEL, ORDRUP CEMETERY, DENMARK
EDWARD THOMSEN, ARCHITECT



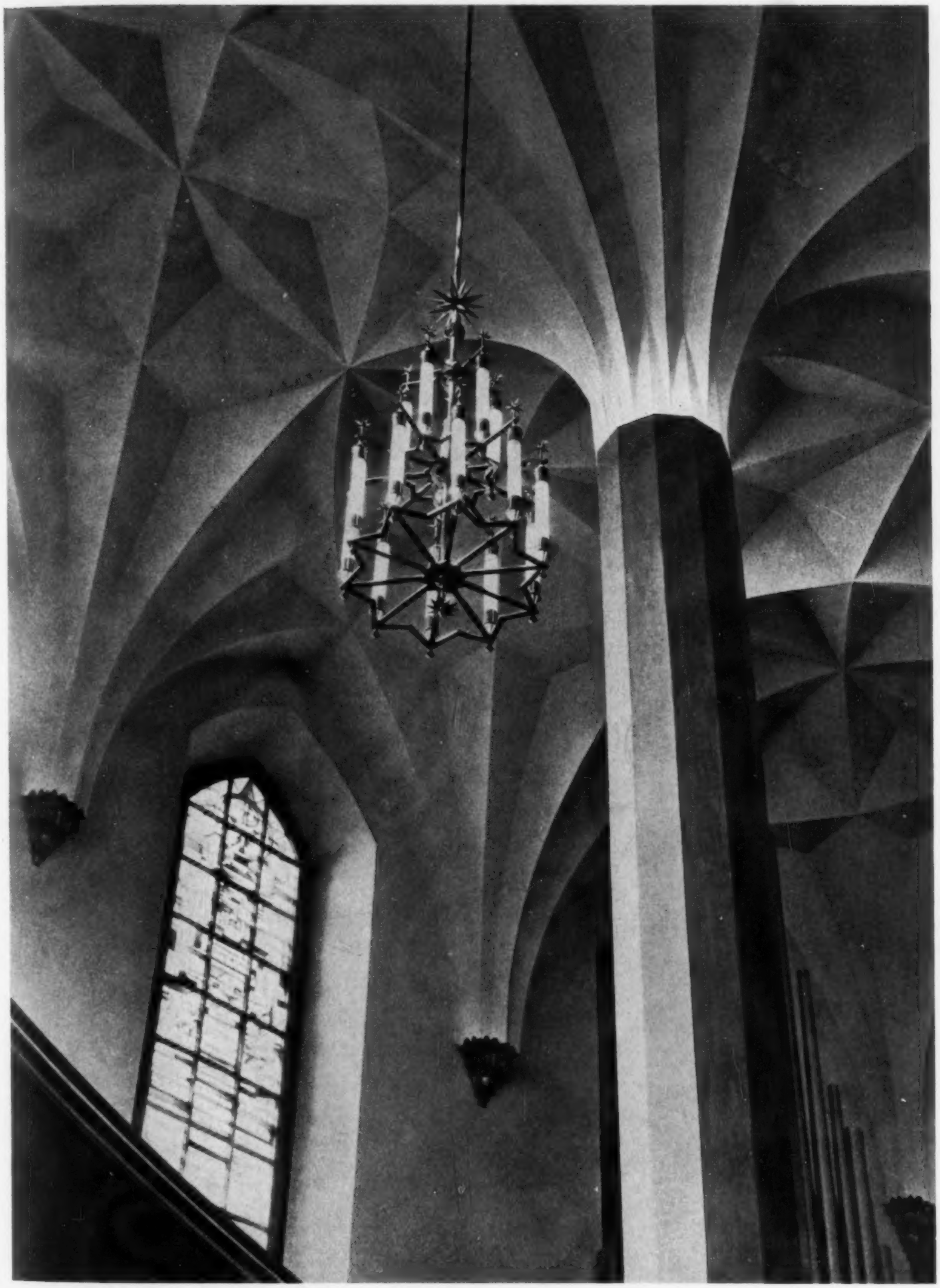
ENTRANCE DOOR
CHAPEL AT ORDRUP CEMETERY, DENMARK
EDWARD THOMSEN, ARCHITECT



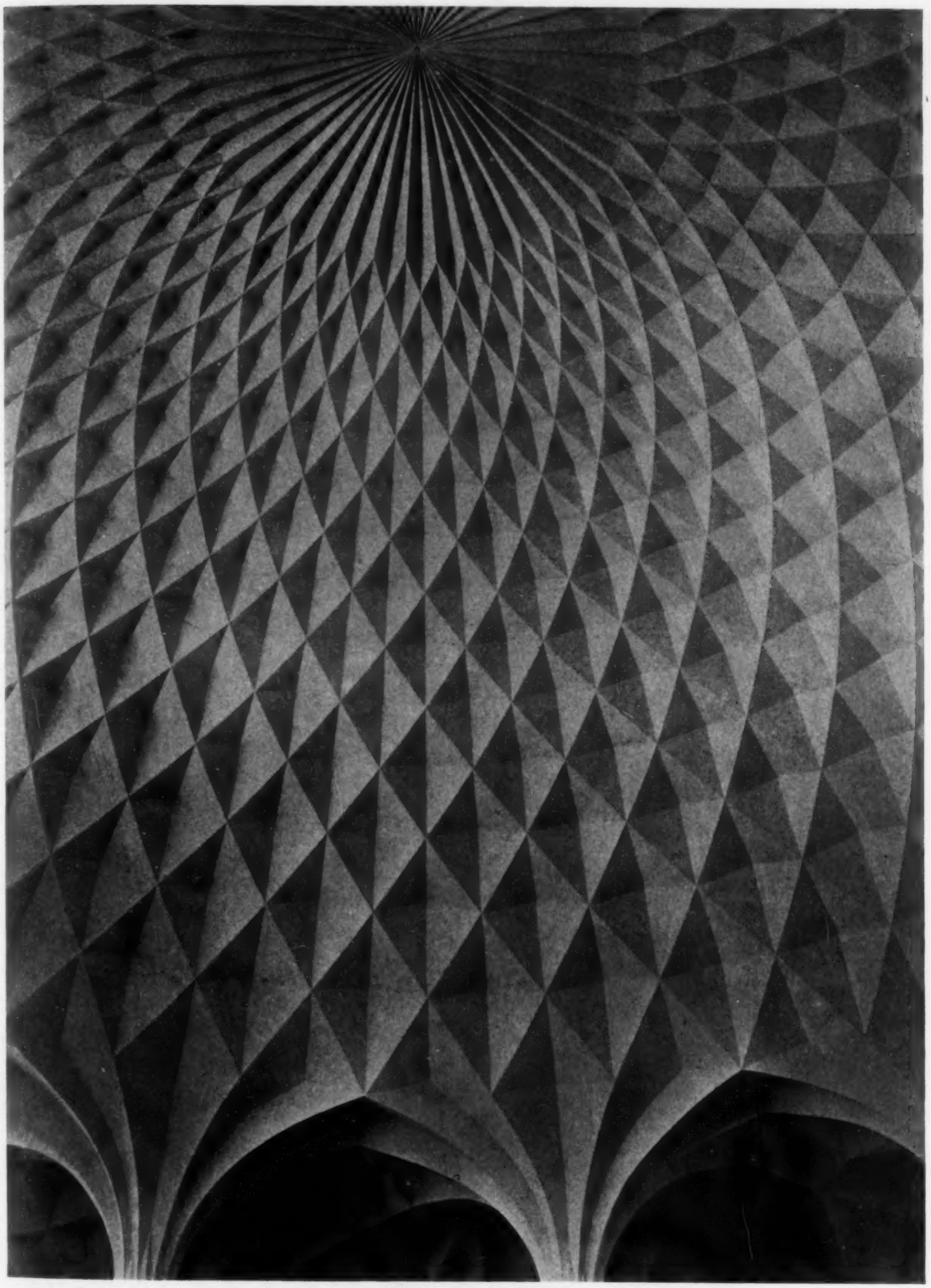
Photos. Sigurd Fischer

CHURCH ON TEMPELHOFER FIELD, BERLIN
STADTBAURAT BRAUNING, ARCHITECT

INTERIOR, CHURCH ON TEMPELHOFER FIELD, BERLIN
STADTBAURAT BRAUNING, ARCHITECT

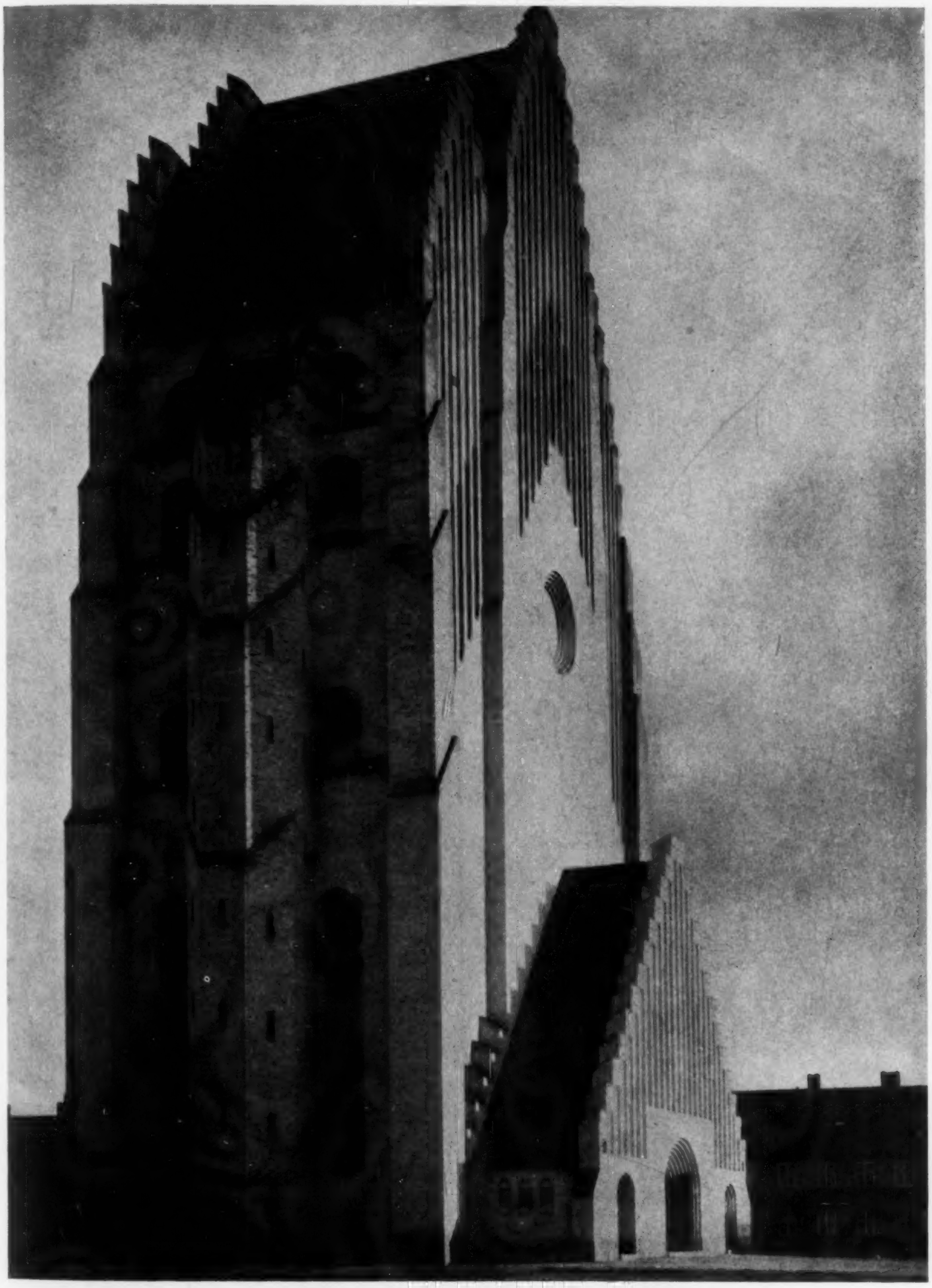


INTERIOR DETAIL
CHURCH ON TEMPELHOFER FIELD, BERLIN
STADTBAURAT BRAUNING, ARCHITECT

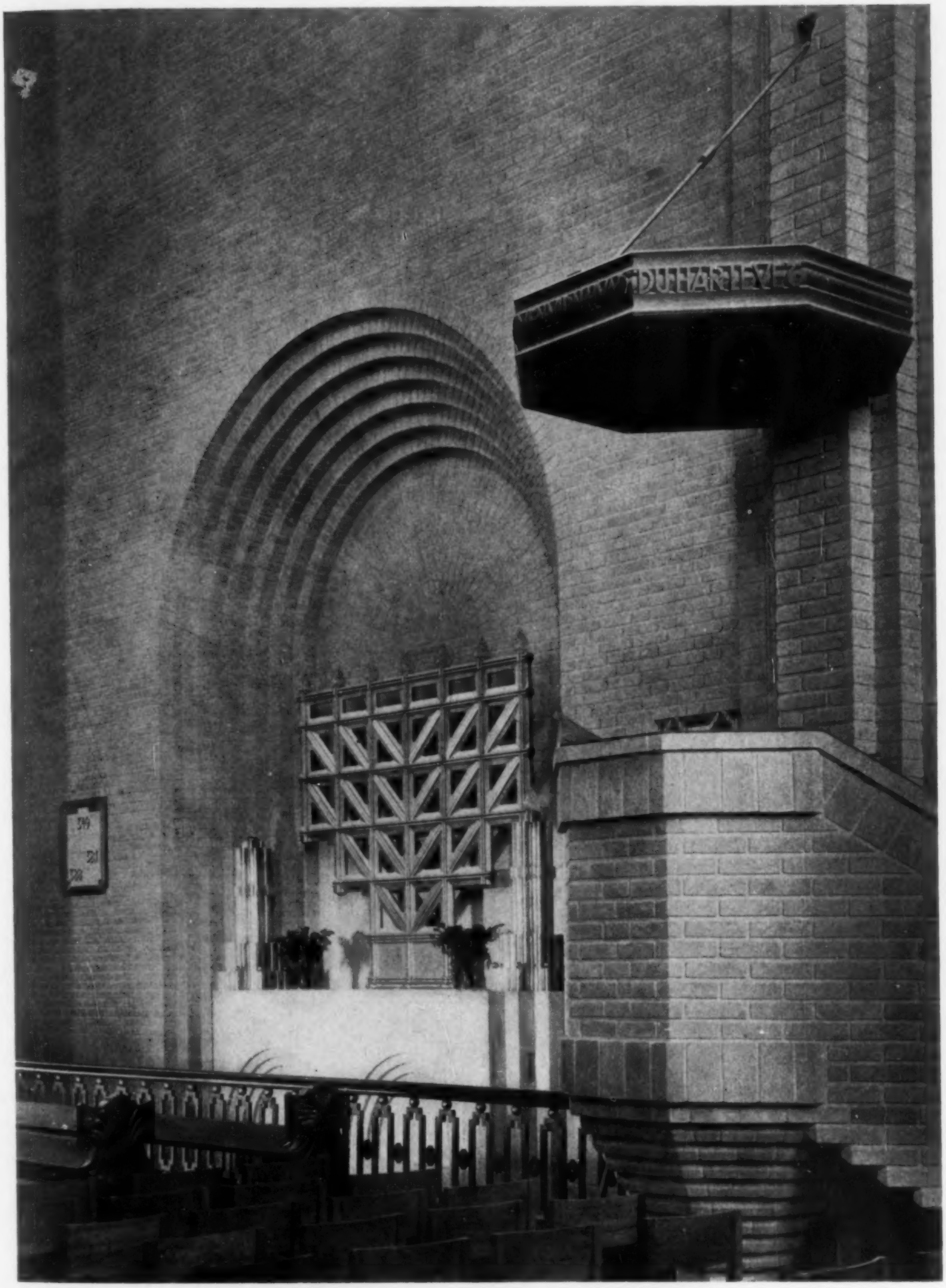


DETAIL OF CEILING
CHURCH ON TEMPELHOFER FIELD, BERLIN
STADTBAURAT BRAUNING, ARCHITECT

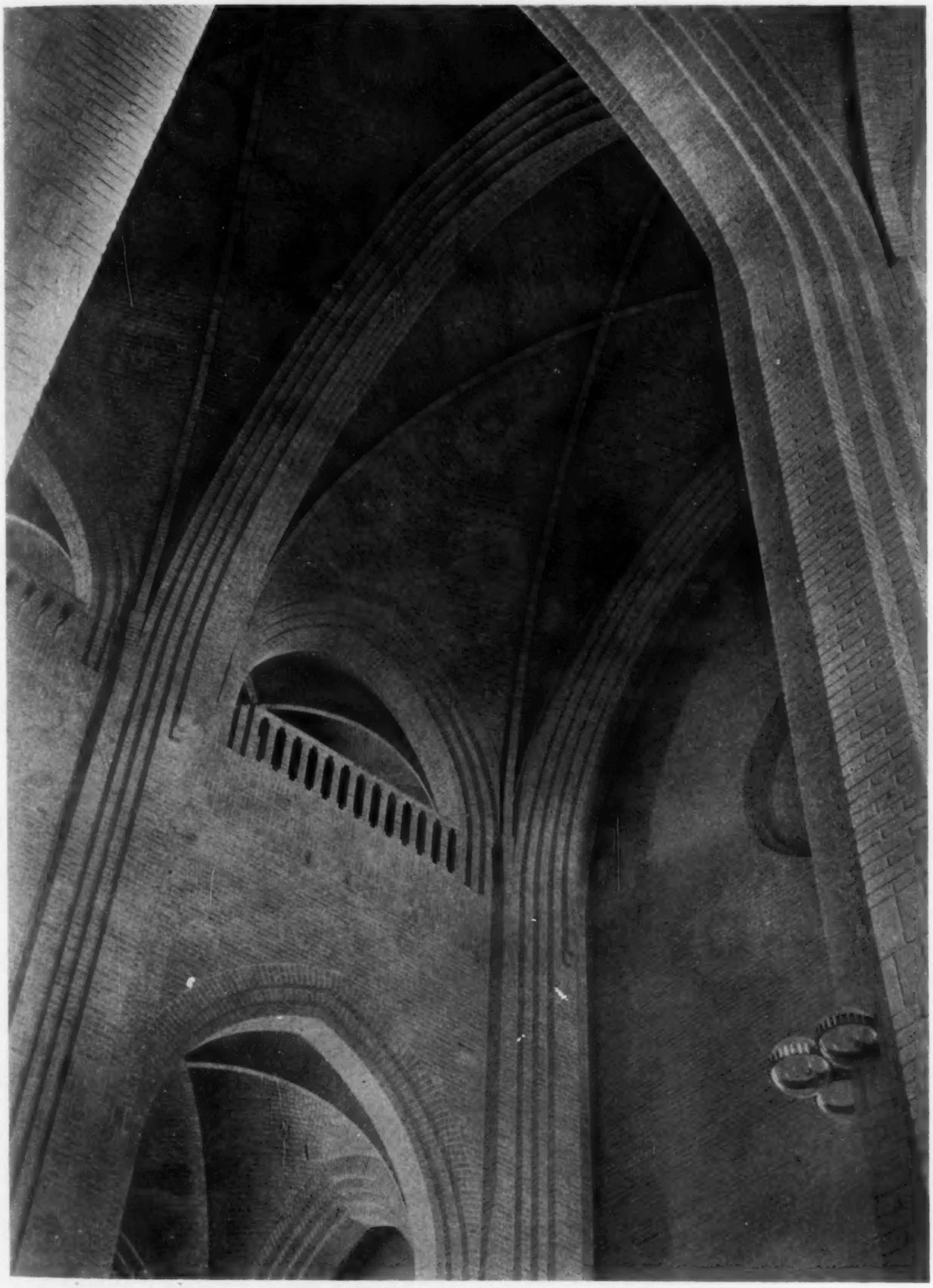
DOOR FROM VESTIBULE TO CHURCH
CHURCH ON TEMPELHOFER FIELD, BERLIN
STADTBAURAT BRAUNING, ARCHITECT



GRUNDTVIG CHURCH, COPENHAGEN
P. V. JENSEN-KLINT, ARCHITECT



DETAIL TEMPORARY CHAPEL IN TOWER
GRUNDTVIG CHURCH, COPENHAGEN
P. V. JENSEN-KLINT, ARCHITECT

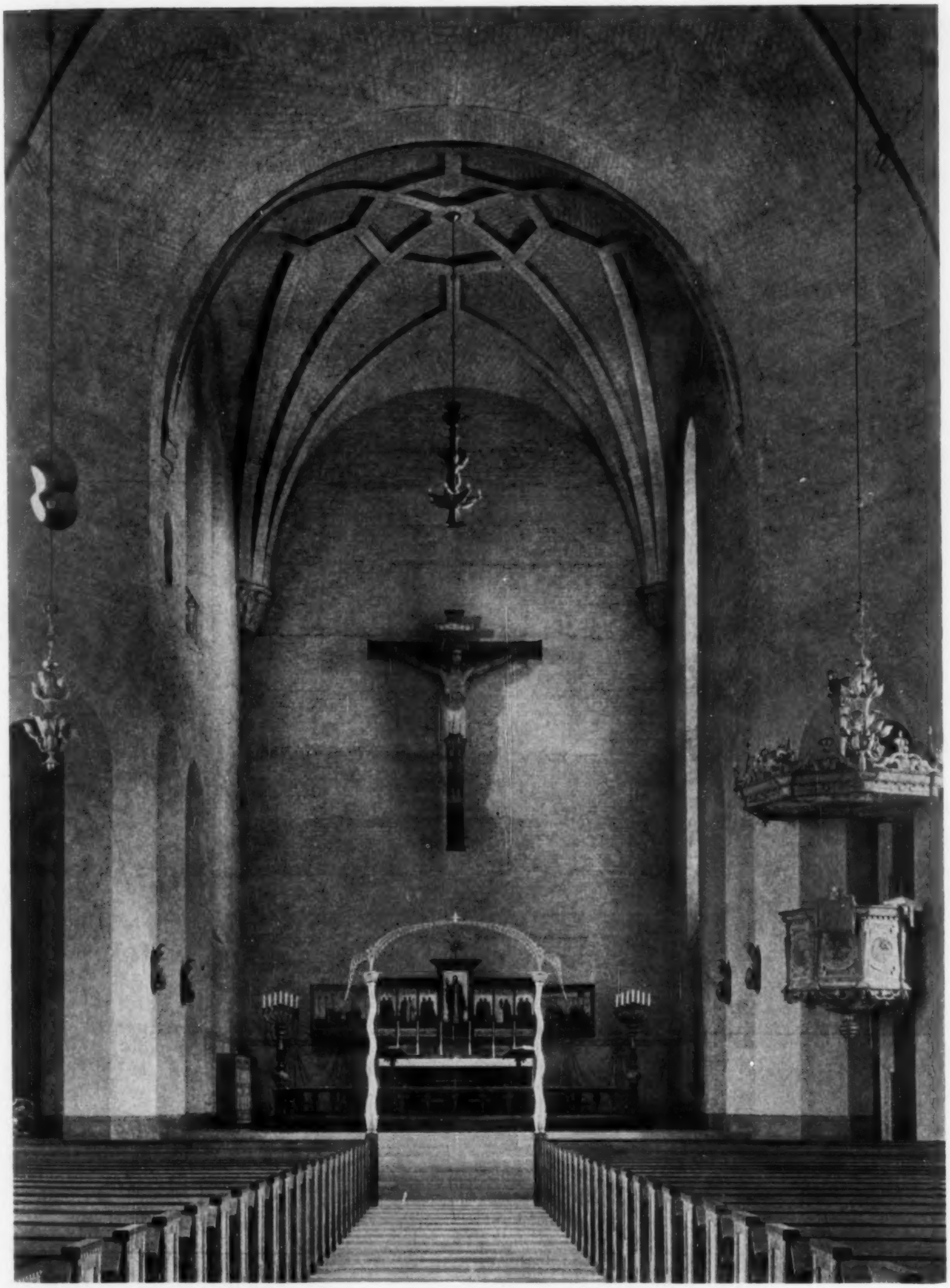


DETAIL OF CEILING
GRUNDTVIG CHURCH, COPENHAGEN
P. V. JENSEN-KLINT, ARCHITECT

VIEW OF WEST FRONT
HOGALID'S CHURCH, STOCKHOLM
IVAR TENGBOM, ARCHITECT

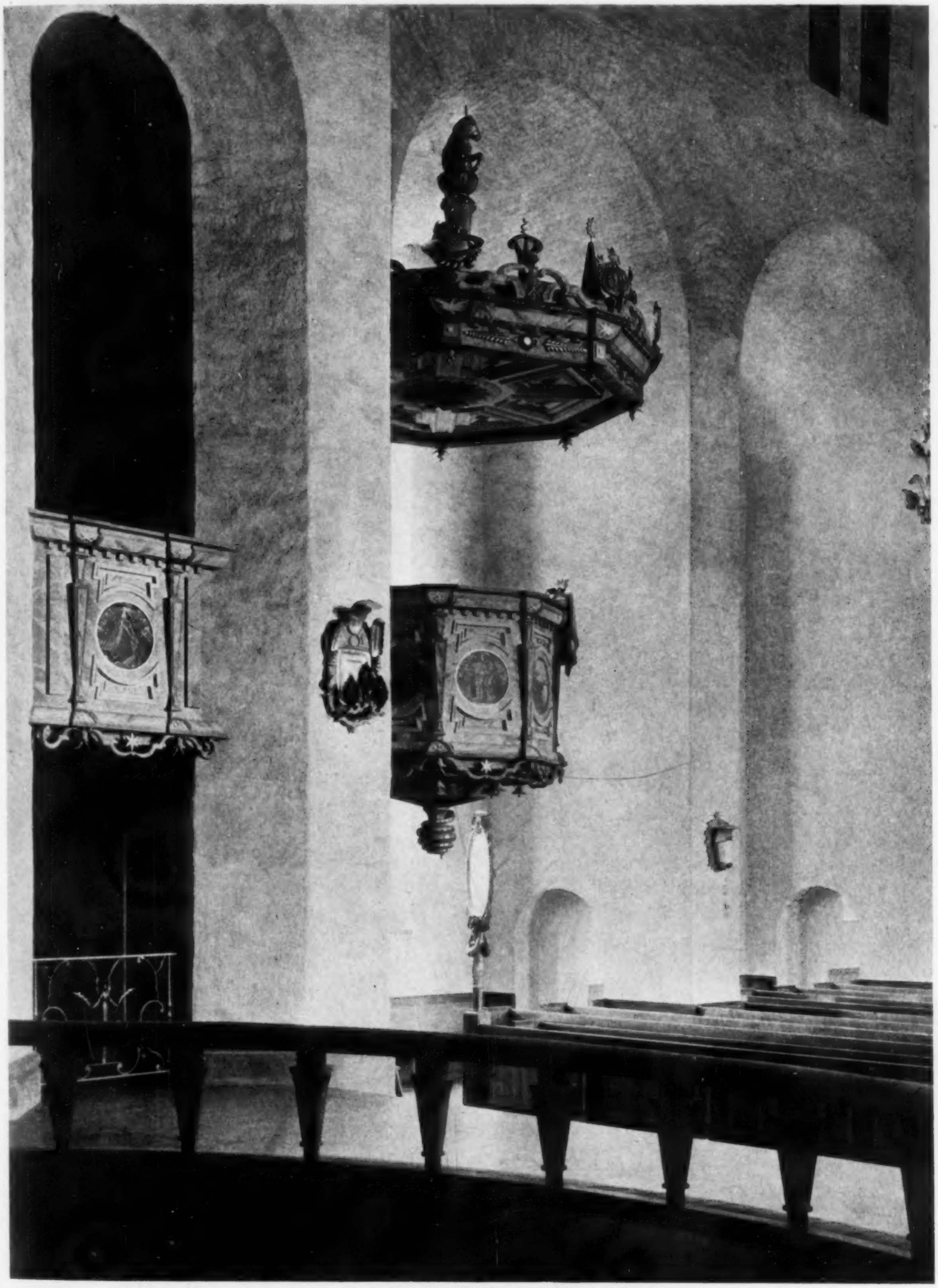
DETAIL OF TOWERS
HOGALID'S CHURCH, STOCKHOLM
IVAR TENGBOM, ARCHITECT

MAIN ENTRANCE
HOGALID'S CHURCH, STOCKHOLM
IVAR TENGBOM, ARCHITECT



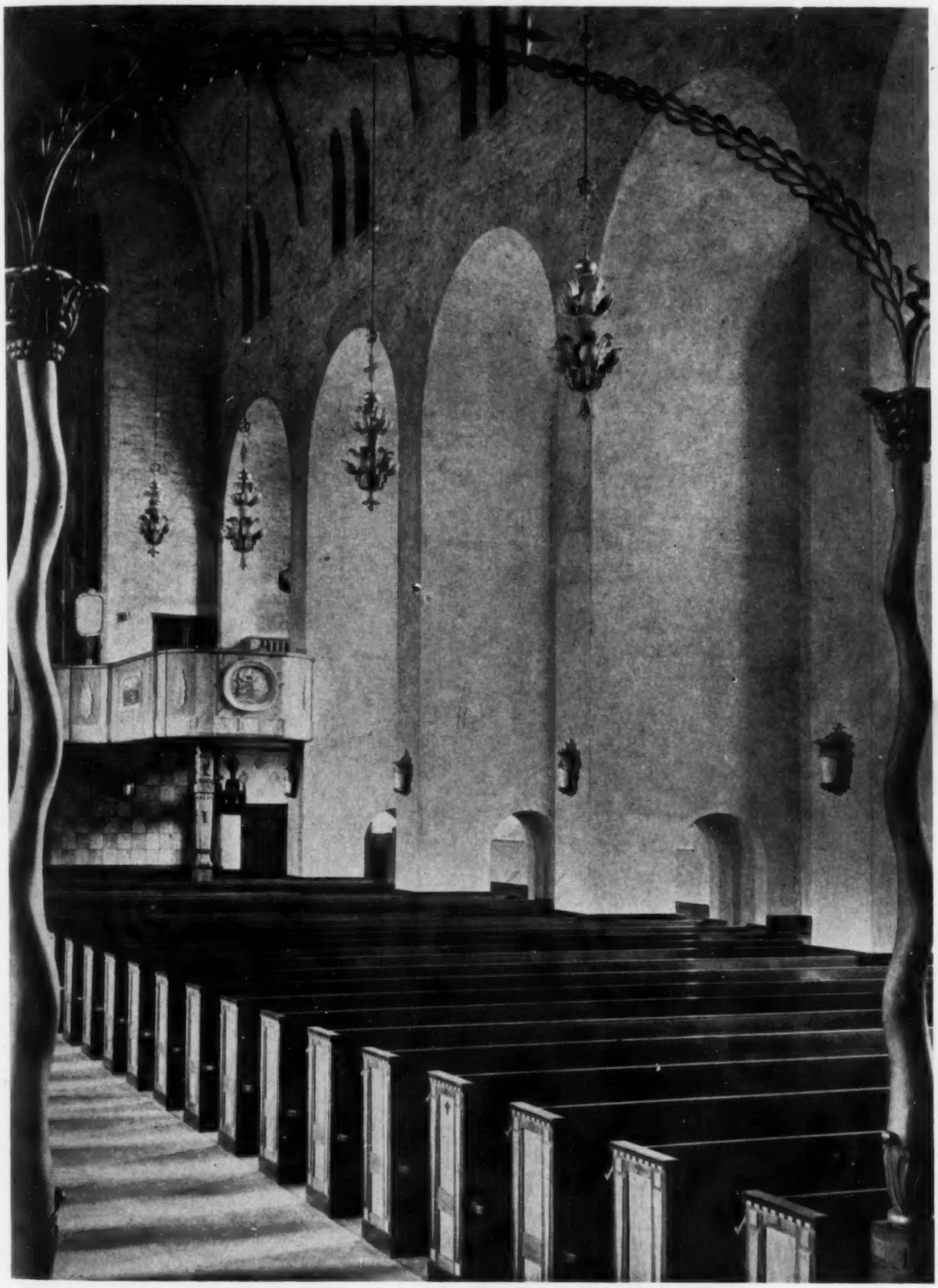
CHANCEL
HOGALID'S CHURCH, STOCKHOLM
IVAR TENGBOM, ARCHITECT

DETAIL OF PULPIT
HOGALID'S CHURCH, STOCKHOLM
IVAR TENGBOM, ARCHITECT



VIEW FROM CHANCEL
HOGALID'S CHURCH, STOCKHOLM
IVAR TENGBOM, ARCHITECT

DETAIL PEWS AND ORGAN BALCONY
HOGALID'S CHURCH, STOCKHOLM
IVAR TENGBOM, ARCHITECT



INTERIOR
HOGALID'S CHURCH, STOCKHOLM
IVAR TENGBOM, ARCHITECT

THE OLD TRAPPE CHURCH, 1743

BY

MARIE KIMBALL

HALFWAY toward Reading, on the old turnpike connecting that city with Philadelphia, at the end of an arching avenue of trees, stands a simple, barnlike structure of sturdy dignity,—the Augustus Lutheran Church. Its ample gambrel roof and low, arched porches, and the broad, windswept surfaces of its pale brown stucco walls at once arrest attention and indicate an impressive age,—a remarkable relic of the past.

The "Old Trappe Church," as it is familiarly called, is, aside from certain buildings of the Episcopal Church, one of the oldest unspoiled houses of worship in America. Not only is the building unique in type, but on the interior we find characteristics that are survivals, unexampled elsewhere, of the forms peculiar to the seventeenth century evangelical church. It was built in 1743 by Heinrich Melchior Muehlenberg, the distinguished Lutheran divine, in the wilderness of the Perkiomen Valley, for a congregation incredibly poor and destitute but fired with a religious enthusiasm that refused to be subdued. Muehlenberg had but recently arrived from Europe and had received an initiation into the life of the new world by preaching his first sermon in an unfinished log cabin, his second in a carpenter's shop, and his third in a barn at Trappe. Fortunately, he possessed the rugged spirit of a pioneer. Undismayed, he promptly proposed to build a suitable house of worship. No record exists as to who designed the church, but it is not improbable that Muehlenberg was his own architect. In the reports which he sent at frequent intervals to the mother church at Halle, he said that he "attached a plan of a stone church" to the communication he gave the elders to carry about in soliciting subscriptions. It was specified, in the old manner, even now not uncommon in the Pennsylvania-German country, that the church should be "54 Schuh lang bei 39 Schuh breit" and an ample supply of "Rom und Brandwein" was promised the masons for their labors. The estimated cost of the building, as Muehlenberg faithfully wrote to Germany, was £200 sterling, and £100 were immediately subscribed. An appeal to Europe brought help from the German preacher at the Court of St. James, and the church was begun. The very poor in the congregation, who were unable to give money, hauled stone and split shingles for the building, and aided in other ways.

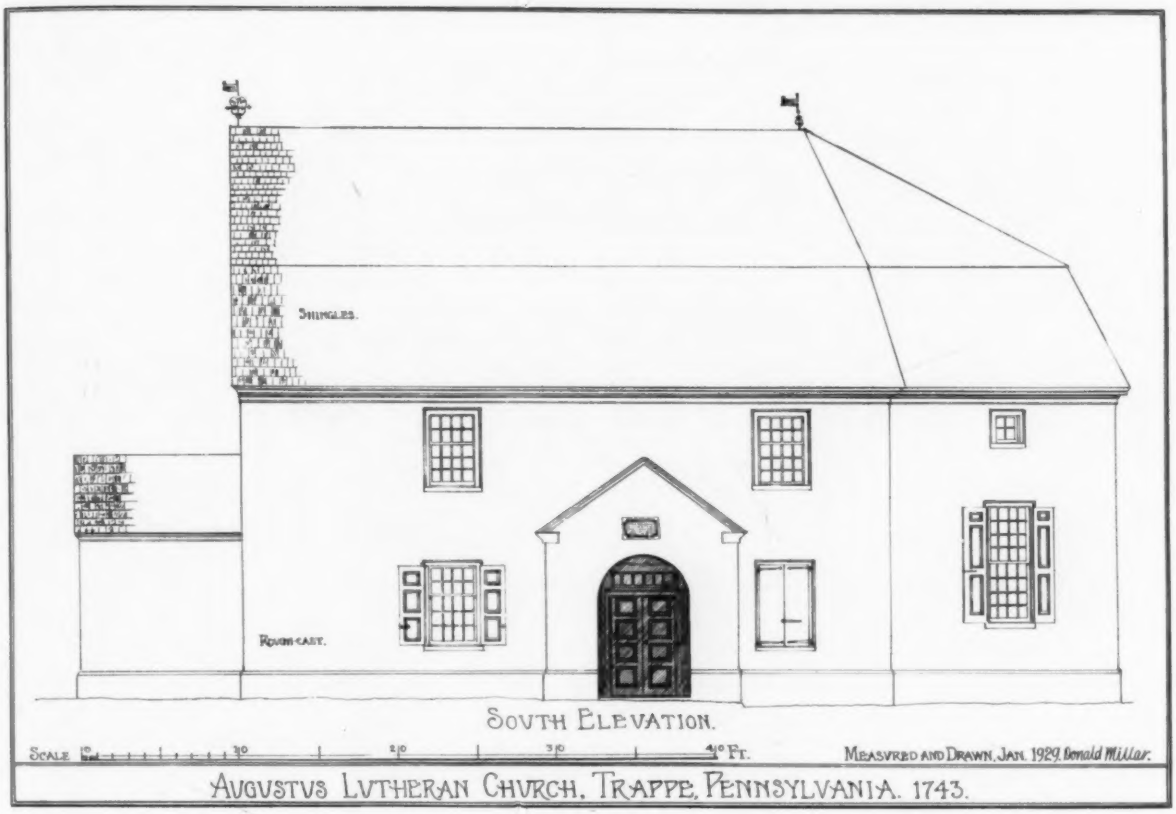
Photos. Courtesy of the Pennsylvania Museum

Augustus Lutheran Church, Trappe, Pa.

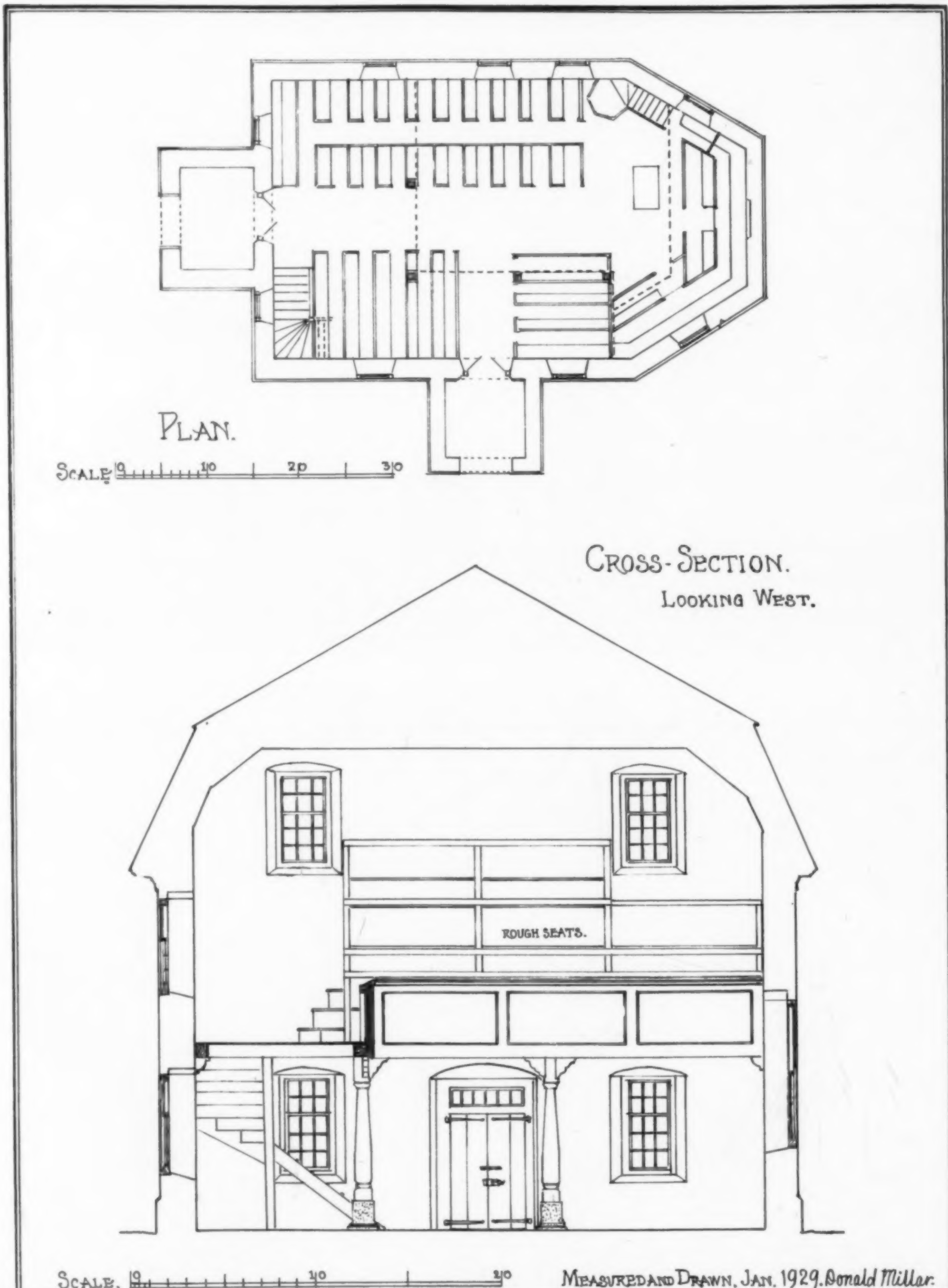
WEST ELEVATION

EAST ELEVATION

AUGUSTUS LUTHERAN CHURCH, TRAPPE, PA.


Shingles.
Rough-cast.
South Elevation.
Scale
Ft.
Measured and Drawn, Jan. 1929. Donald Millar.
Augustus Lutheran Church, Trappe, Pennsylvania. 1743.


West End.
East End.
Scale
Ft
Measured and Drawn, Jan. 1929. Donald Millar.
Augustus Lutheran Church, Trappe, Pennsylvania. 1743.



AUGUSTUS LUTHERAN CHURCH, TRAPPE, PENNSYLVANIA, 1743.

On the second of May, 1743, the corner stone was laid. The Latin dedicatory inscription placed on the church wall may still be read: "Under the guidance of Christ, Heinrich Melchior Muehlenberg, together with the elders, J. N. Grosman, F. Marsteler, A. Heilman, H. Has and G. Kebner, upon this very ground erected this church dedicated to the denomination adhering to the Augsburg Confession." Within four months the congregation had moved from the barn and was worshiping in its own church, although the building was not finished,—indeed it was barely under roof. Two years later, in September, 1745, the church was finally completed and dedicated. Divine services were held henceforth regularly for over a hundred years. The passion for improvement which swept this country in the middle of the nineteenth century mercifully passed by Muehlenberg's old church, and it was left untouched. Instead of remodeling the building or tearing it down, the congregation, now grown rich, contented itself by building a "large and commodious" brick structure in the latest style, discarding the old church and preserving it for our delight and wonder.

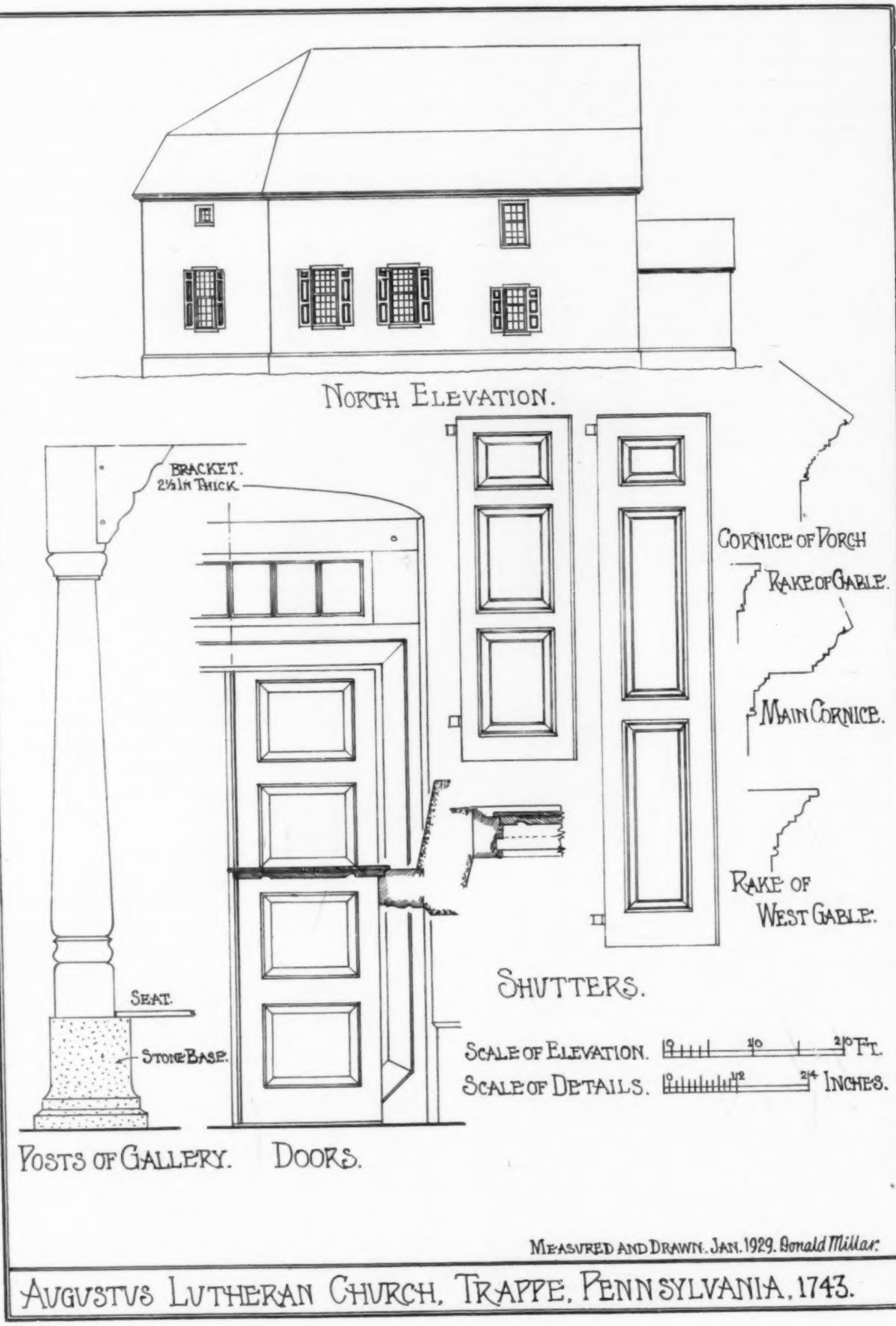
To enter Muehlenberg's church is to step back into the seventeenth century. The visitor finds himself in a square hall with galleries on three sides, supported by great oak posts resting on red sandstone blocks. The woodwork of the church is of a character that in England would be called Jacobean. Here may still be seen the heavy wood supports and gallery railings in vogue in the colonies a hundred years before the church was built, the high-backed box pews of oak and poplar, simply paneled and unpainted or unvarnished for two centuries, but gleaming from the touch of countless hands. A branding iron was used to mark the numbered place of each worshiper on the hymnbook holders secured to the backs of the pews. Locks and painted numerals on the doors set off the pews beneath the western gallery for the more prosperous. These doors have a tombstone-like form which corresponds closely to that of the fielded panels of the rooms from Millbach, Pennsylvania, 1752, belonging to the Pennsylvania Museum. The other pews were apparently open at first, with curved ends, still to be seen in one or two instances. At a later time many more were closed by paneled doors of pine. The butt hinges as well as the paneling of these doors indicate the later date. These contrast sharply with the richly carved strap hinges of the oldest pew doors, which are beautiful examples of the work of the early Pennsylvania smith, possessing the rich simplicity of the period.

Old Pulpit

As was usual, the sexes were separated, the women sitting on the northwest side, the men opposite, the pews under the organ being reserved for the elders of the church. Servants and boys were obliged to climb the winding stairs to the rigid benches in the gallery, much like rough modern "bleachers," where they worshiped under the supervision of the sexton! The northeast gallery, with its pierced balustrade of blue and white, was added to the church in 1751 to contain the new organ that had recently been imported from Europe. Muehlenberg's congregation was one of the first in rural Pennsylvania to purchase an organ. To protect it and the singers from intrusion there was erected a fence of palings, likewise cut in curved outline, and decorated in the favored blue and white. The marbling of the same colors on the columns we know to have been done in 1814. Such decorative painting was not unknown even in the English colonies along the Atlantic seaboard.

To conform to the ritual of the Lutheran Church, the sanctuary, at one end of the building, is an octagonal apse. The white painted altar was placed in the open space before the high pulpit, resting on a great hexagonal post from which extend brackets sawn to shape. In sharp contrast to this, which, like the other original features of the church, preserves mediæval characteristics, is the pulpit itself, of paneled walnut. Here more than anywhere else in the building we see the typical Georgian characteristics of the eighteenth century, though, to be sure, in a simple form. Here only do we find classic mouldings and, on the sounding board above, a classic cornice, all of which is decidedly architectural.

Certain changes have been made in the building in the course of time, but none have been of great consequence. The sash seem to have been replaced around 1800, the original sash presum-

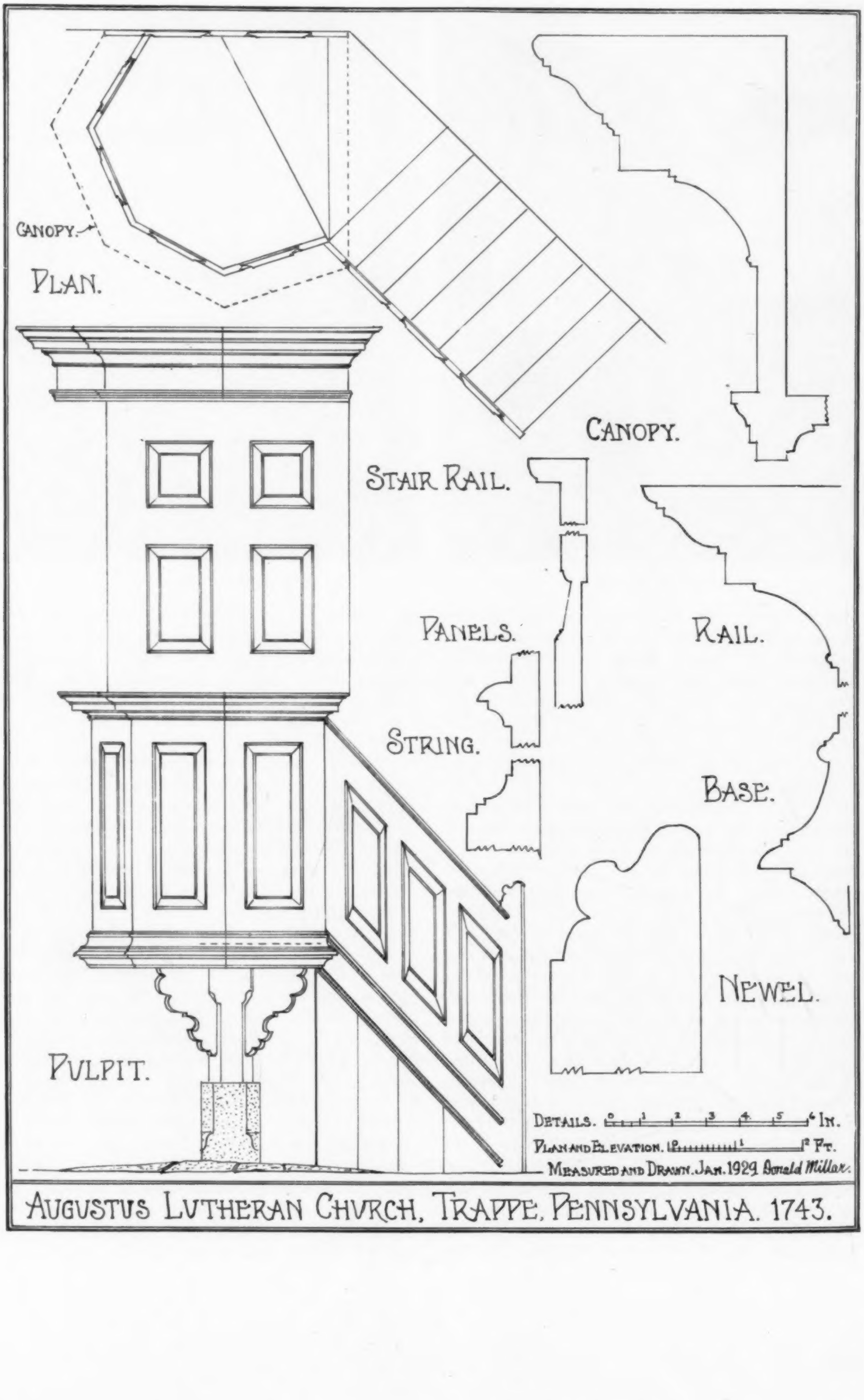

NORTH ELEVATION.
BRACKET. 2½ IN THICK.
CORNICE OF PORCH
RAKE OF GABLE.
MAIN CORNICE.
RAKE OF WEST GABLE.
SHUTTERS.
SEAT.
STONE BASE.
SCALE OF ELEVATION. 0 10 20 FT.
SCALE OF DETAILS. 0 12 24 INCHES.
POSTS OF GALLERY.
DOORS.
MEASURED AND DRAWN. JAN. 1929. Donald Millar.
AUGUSTUS LUTHERAN CHURCH. TRAPPE. PENNSYLVANIA. 1743.

The Marbled Columns

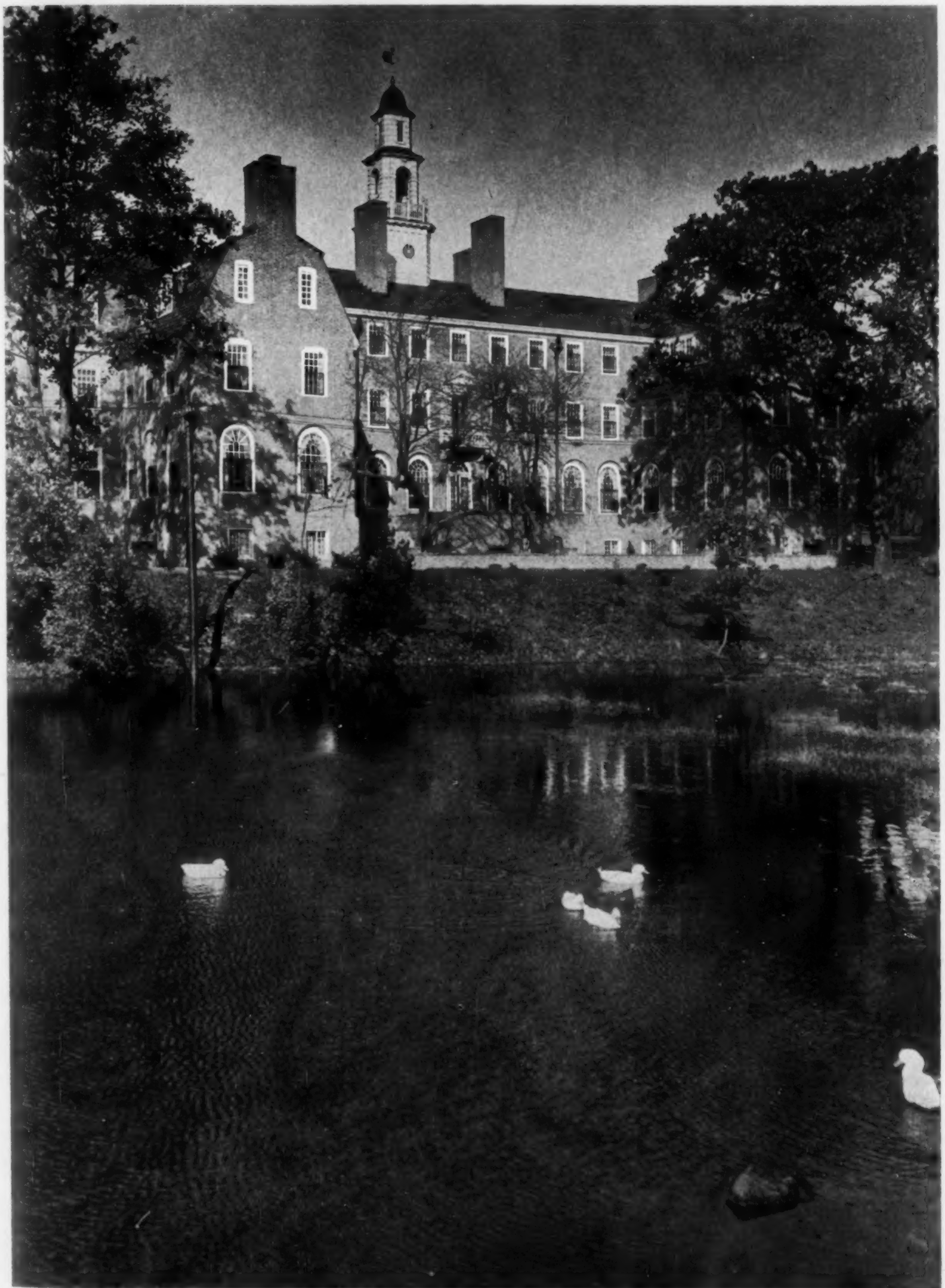
The Oldest Pews

ably having had the same heavy bars that we still see in the transom over the doorway. The floor, originally of irregular blocks of sandstone, has long since been supplanted by a floor of wood. For many years the sexton spread straw on the floor of the pews, and the women brought hot bricks to fight the cold. Some 70 years after the building of the church the conservative congregation at last invested in a stove! To the rear of the church lies the old burying ground, its ancient gray tombstones rudely carved with those emblems characteristic of every form of artistic endeavor undertaken by the Pennsylvania Germans. Many of the graves are unmarked, and numerous inscriptions have been effaced by time. Some of the stones lie half buried in the earth, but enough remain in the oldest part to show that the graves of those first buried there faced the fatherland that lay in the distant East. Although this section of the country was settled shortly after 1683, and the cemetery may well have been used not long thereafter, the earliest legible epitaph is dated much later. It reads: "Here Lyeth the Body of Hannah Schrack. Was Born April 17 1722. Died September 9 1736."

The Old Trappe Church played its part in the Revolutionary War, although it was left unharmed by the marching feet of the rival soldiers who passed through it from time to time. During the early days of the war the church was used to house outposts of the colonial militia. A few days after the battle of Brandywine, in 1777, General Washington crossed the Schuylkill and marched toward Trappe, leaving the British encamped on the opposite side of the river. The window is still pointed out from which the anxious Muehlenberg watched the enemy through a telescope. A week later they arrived. The soldiers were quartered in the pastor's barn, where they promptly destroyed the hay, and then overran the church. Stacking their arms in a corner they amused themselves playing the organ and singing. Meanwhile the genial pastor played host to Lord Sterling and General Wayne in the parsonage. Subsequently the church was transformed into a hospital. It was used in this capacity until the army went into winter quarters at Valley Forge, when it was once more given over to divine services. Henceforth they were held regularly until 1851. Even now, however, the old church is not wholly abandoned. Once a year, on a Sunday in June, the congregation gathers from far and near to pay homage to Muehlenberg and old memories. It would be difficult to find anywhere in America a building so characteristic of its time. It stands at the end of an avenue of old trees and surveys the changing world of today just as it has seen the passing of several generations during almost two centuries. The old church has been fortunate indeed in escaping the "improvement" which has worked such devastation elsewhere and ruined many an old church.



AUGUSTUS LUTHERAN CHURCH, TRAPPE, PENNSYLVANIA. 1743.



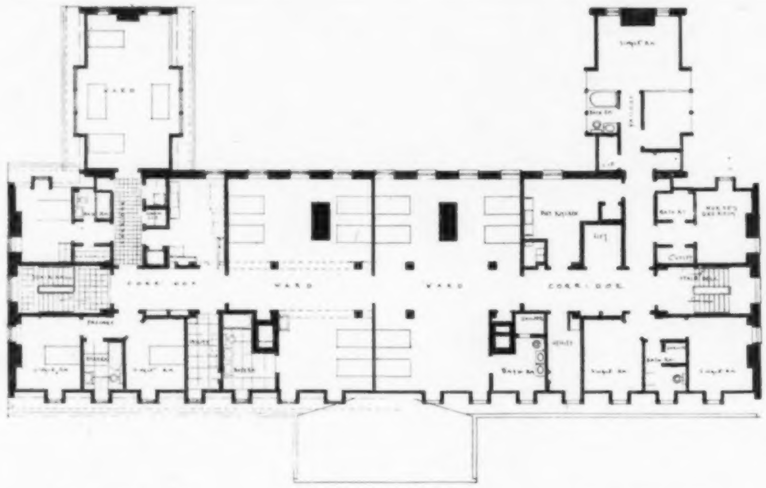
Photos. Sigurd Fischer

VIEW ACROSS WATER

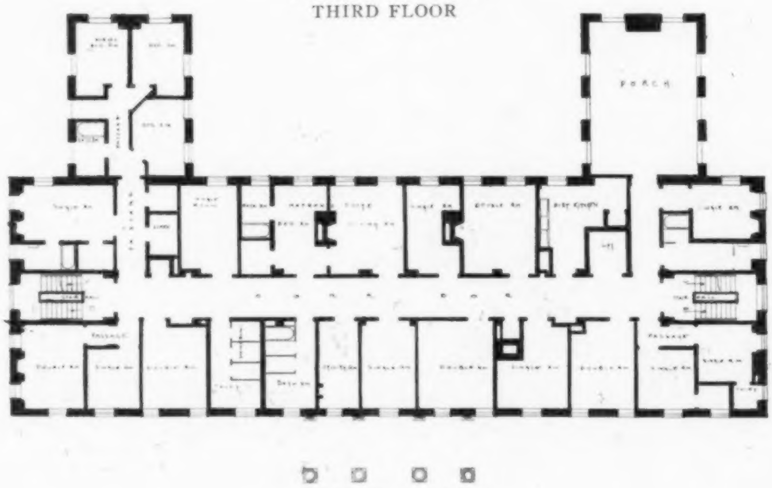
INFIRMARY, CHOATE SCHOOL, WALLINGFORD, CONN.

CRAM & FERGUSON, ARCHITECTS

Plans on Back



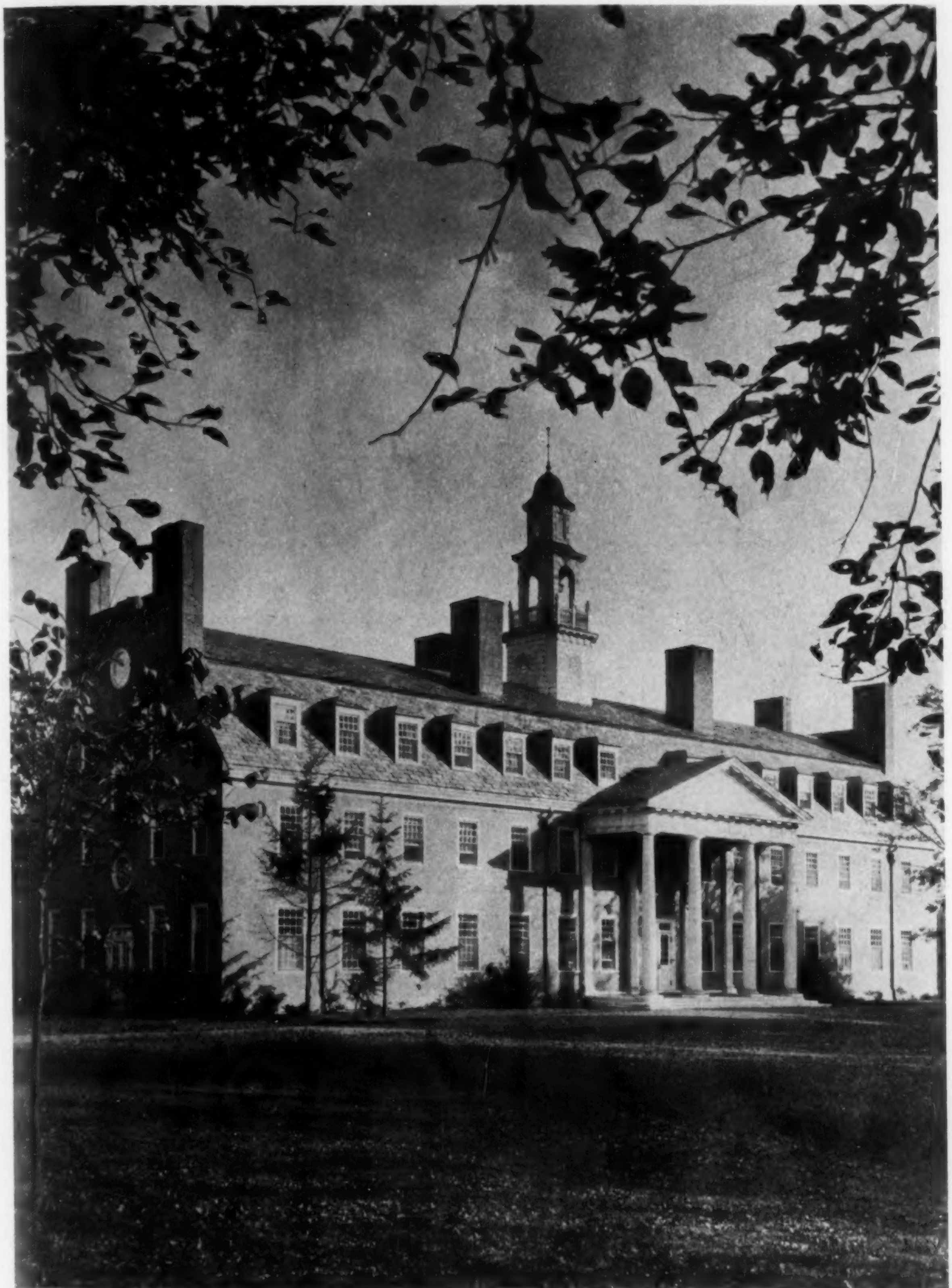
THIRD FLOOR



SECOND FLOOR

FIRST FLOOR

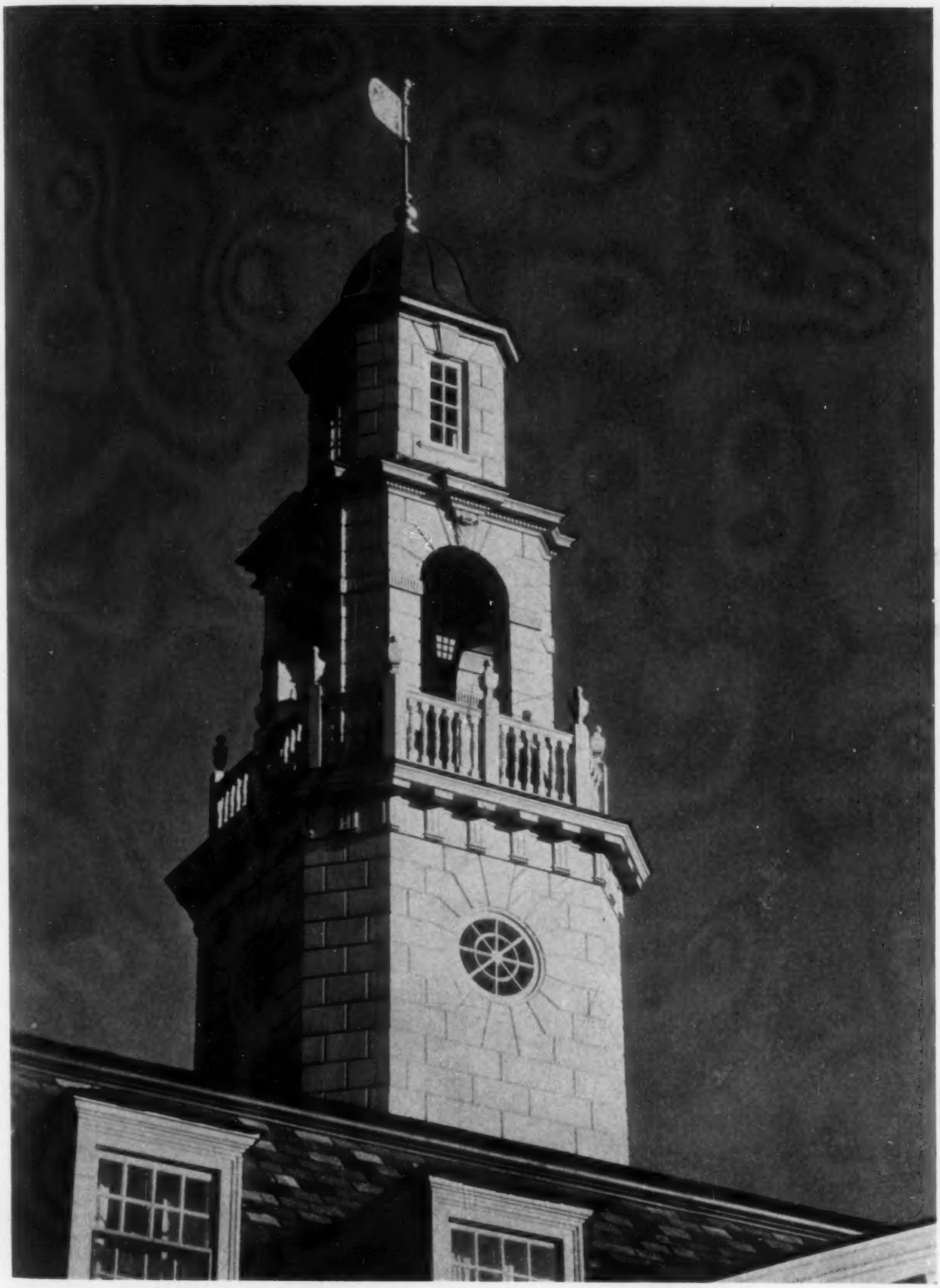
PLANS. INFIRMARY, CHOATE SCHOOL, WALLINGFORD, CONN.
CRAM & FERGUSON, ARCHITECTS



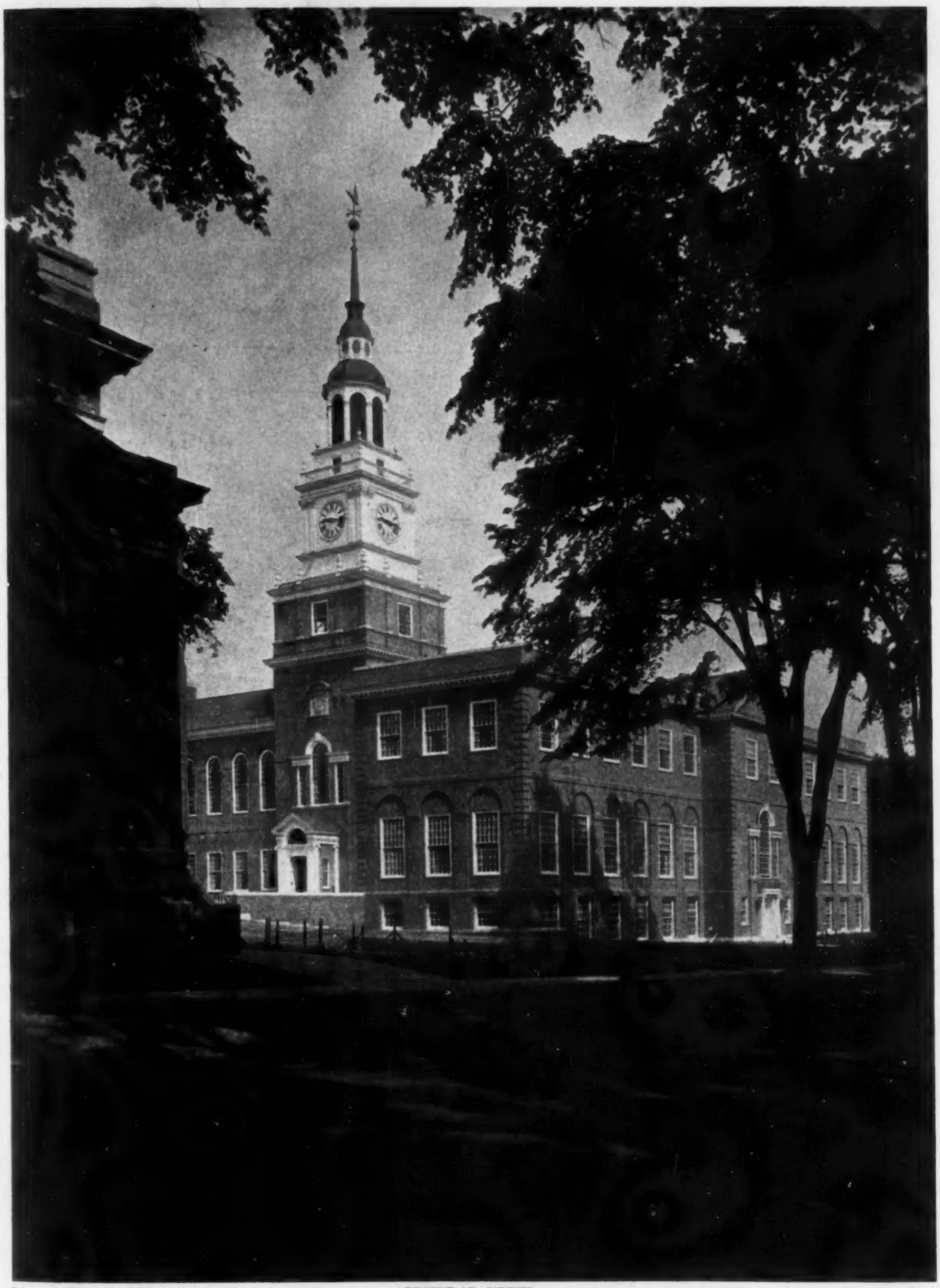
Photos. Paul J. Weber

GENERAL VIEW
INFIRMARY, CHOATE SCHOOL, WALLINGFORD, CONN.
CRAM & FERGUSON, ARCHITECTS

THE BRICK TERRACE
INFIRMARY, CHOATE SCHOOL, WALLINGFORD, CONN.
CRAM & FERGUSON, ARCHITECTS

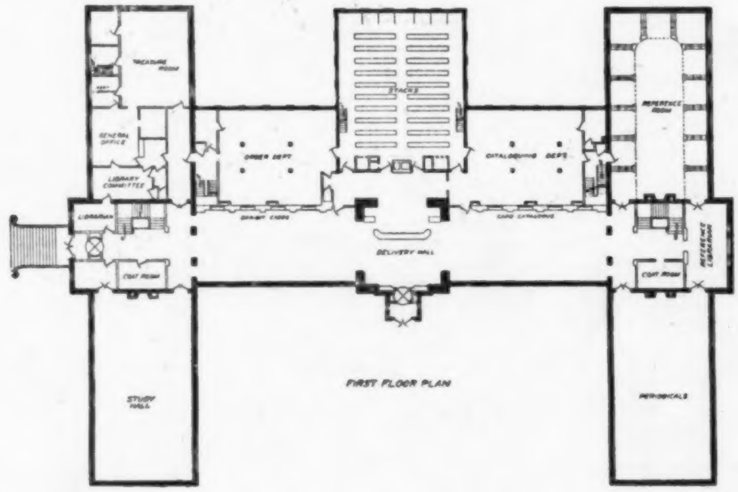


THE CUPOLA
INFIRMARY, CHOATE SCHOOL, WALLINGFORD, CONN.
CRAM & FERGUSON, ARCHITECTS

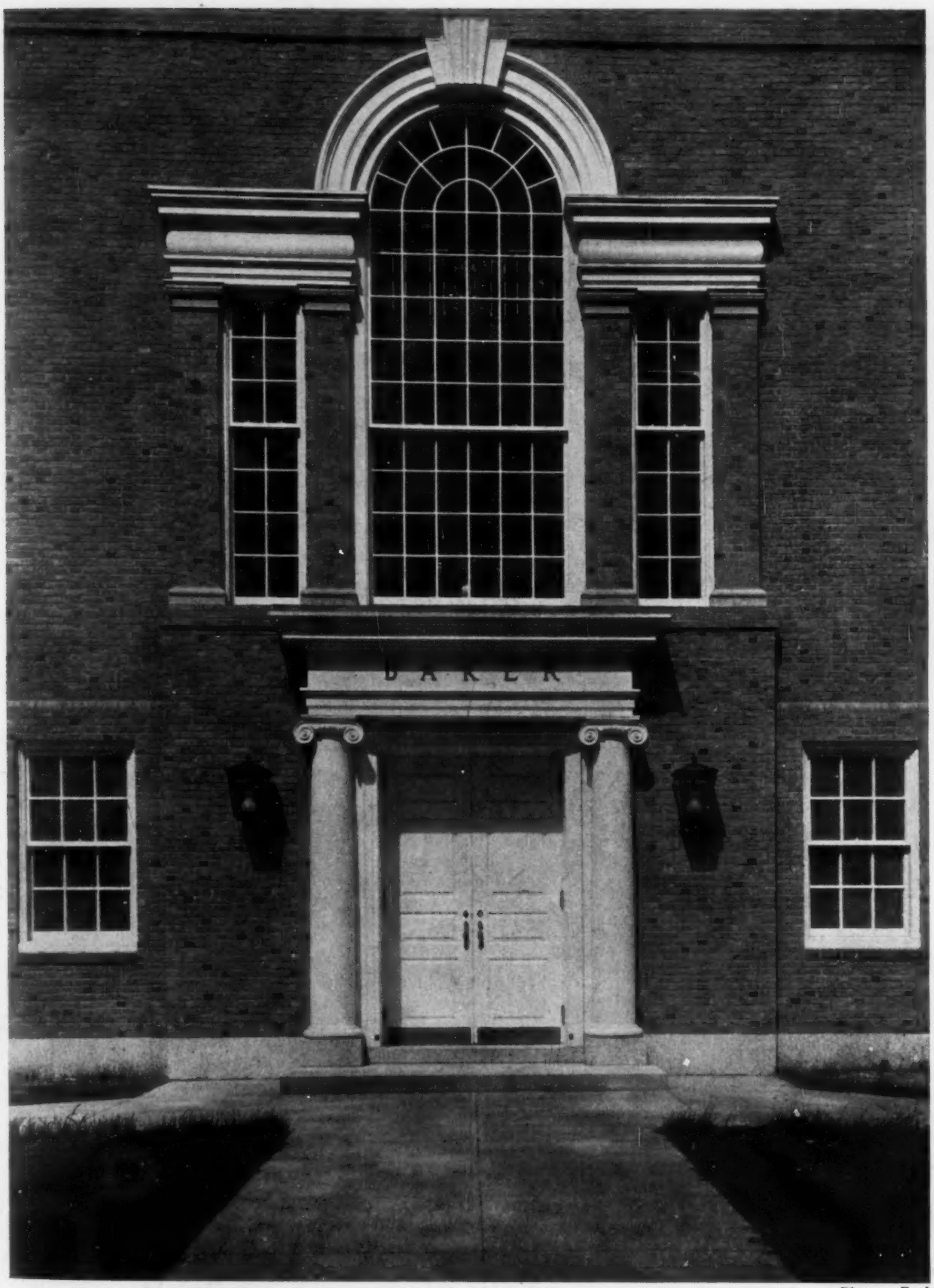


Photos. Paul J. Weber GENERAL VIEW *Plan on Back*

BAKER MEMORIAL LIBRARY, DARTMOUTH COLLEGE, HANOVER, N. H.
JENS FREDRICK LARSON, ARCHITECT



PLAN. BAKER MEMORIAL LIBRARY, DARTMOUTH COLLEGE, HANOVER, N. H.
JENS FREDRICK LARSON, ARCHITECT

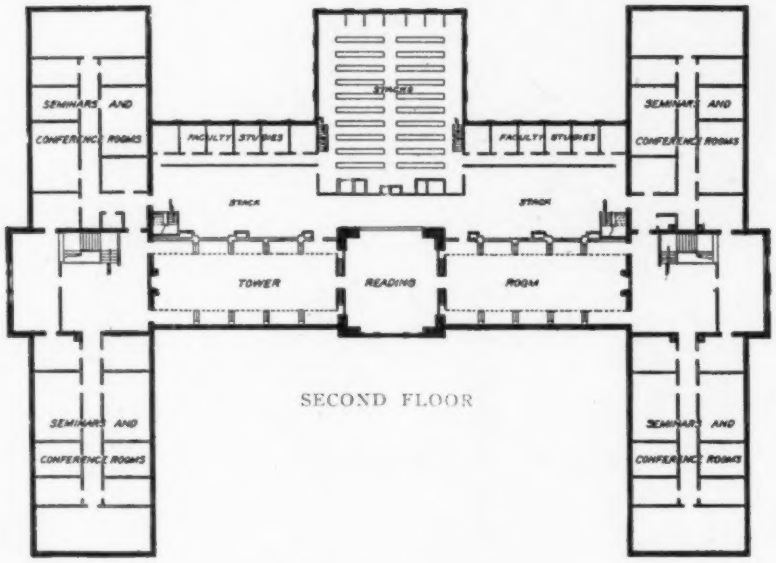


Plans on Back

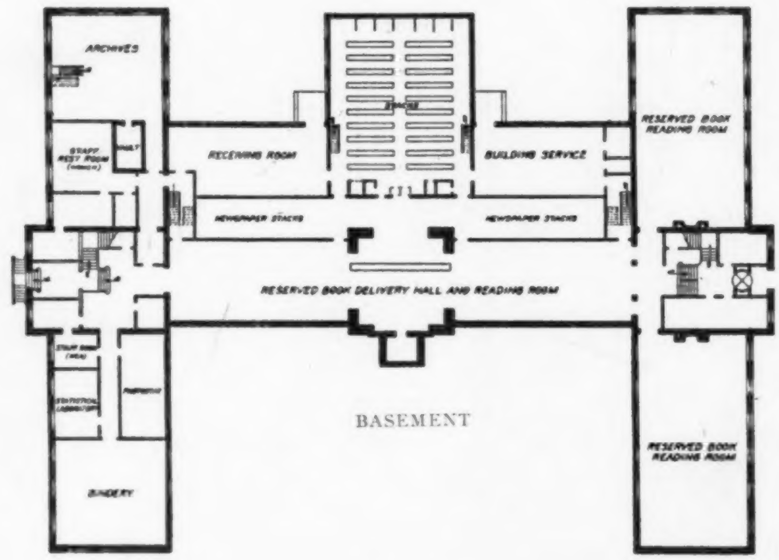
EAST ENTRANCE

BAKER MEMORIAL LIBRARY, DARTMOUTH COLLEGE, HANOVER, N. H.

JENS FREDRICK LARSON, ARCHITECT

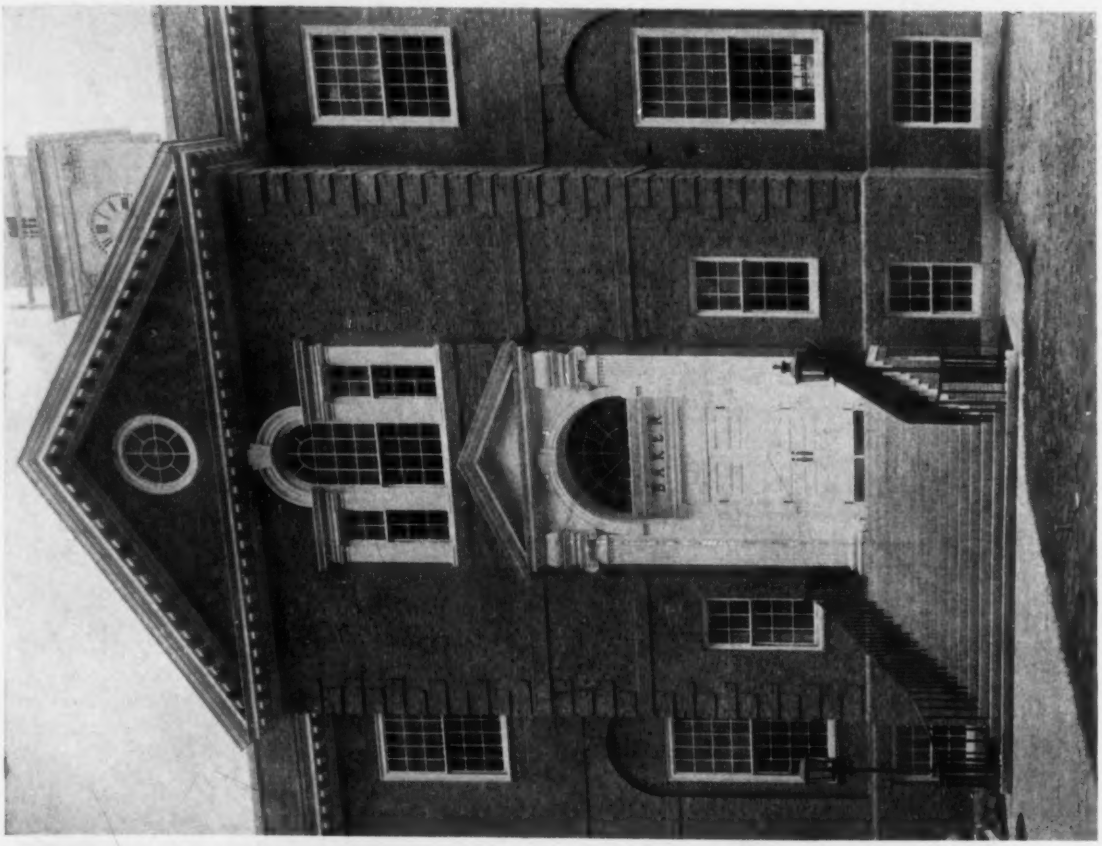


SECOND FLOOR



BASEMENT

PLANS, BAKER MEMORIAL LIBRARY, DARTMOUTH COLLEGE, HANOVER, N. H.
JENS FREDRICK LARSON, ARCHITECT

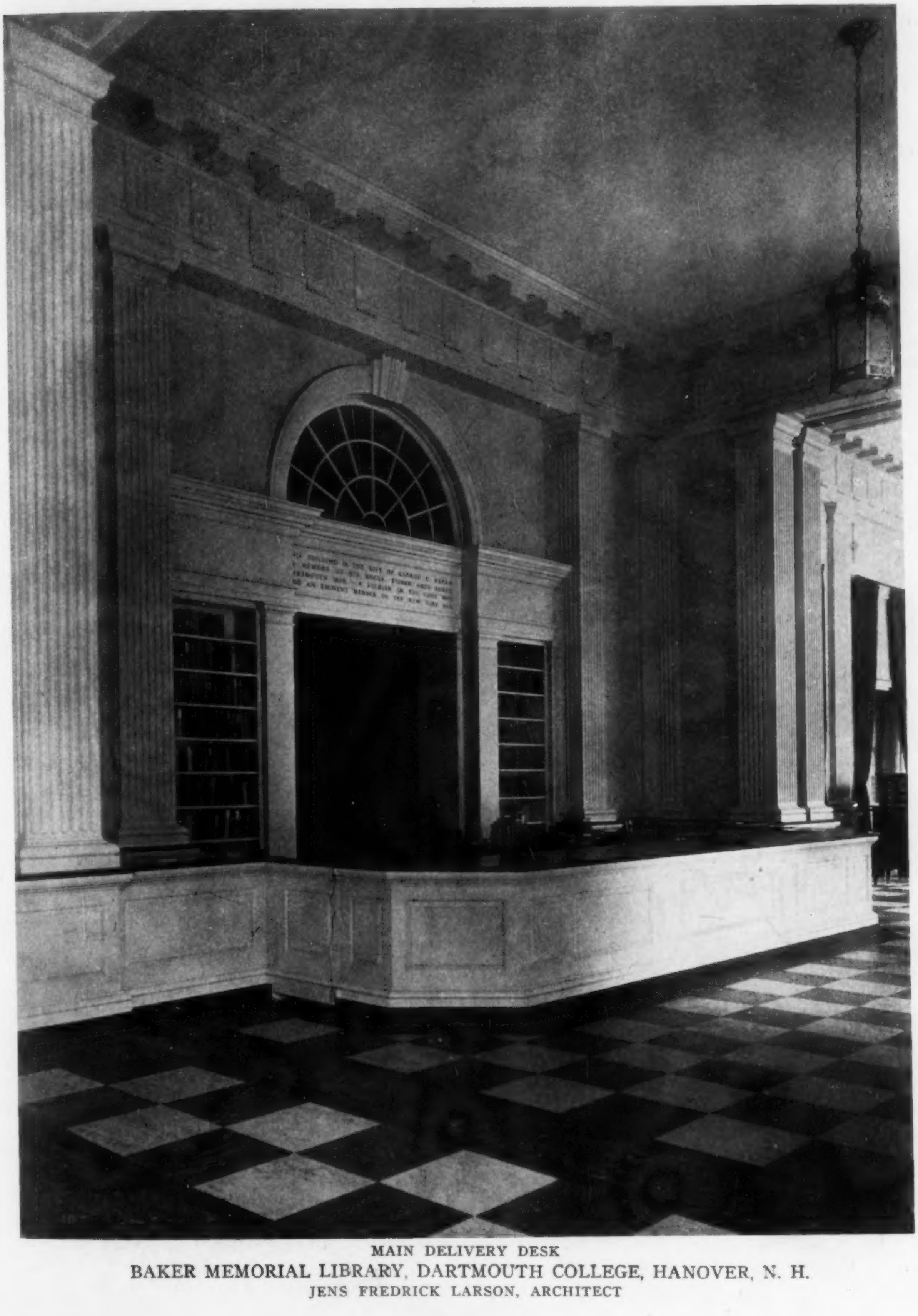


SOUTH ENTRANCE

WEST ENTRANCE

BAKER MEMORIAL LIBRARY, DARTMOUTH COLLEGE, HANOVER, N. H.

JENS FREDRICK LARSON, ARCHITECT



MAIN DELIVERY DESK
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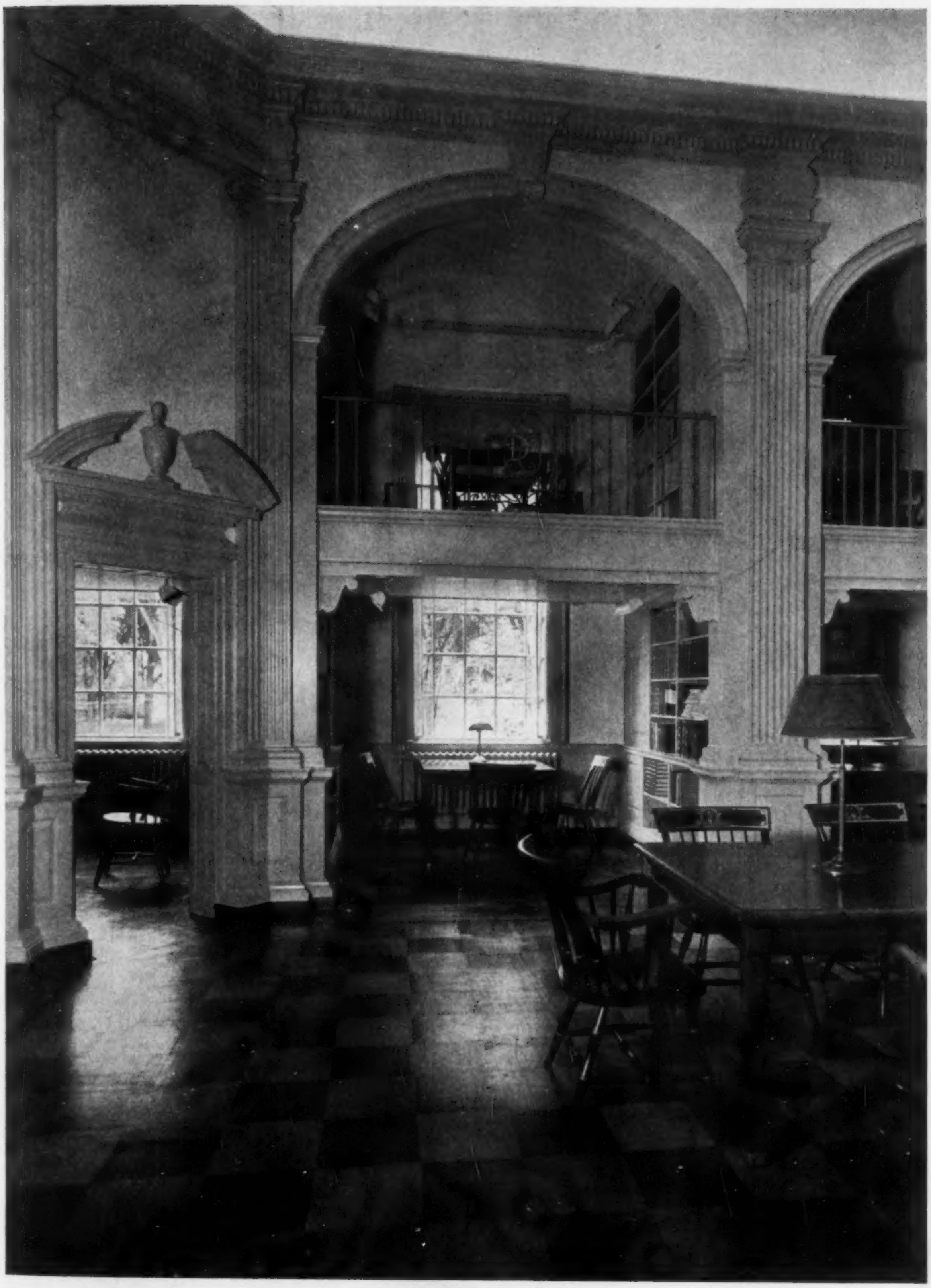
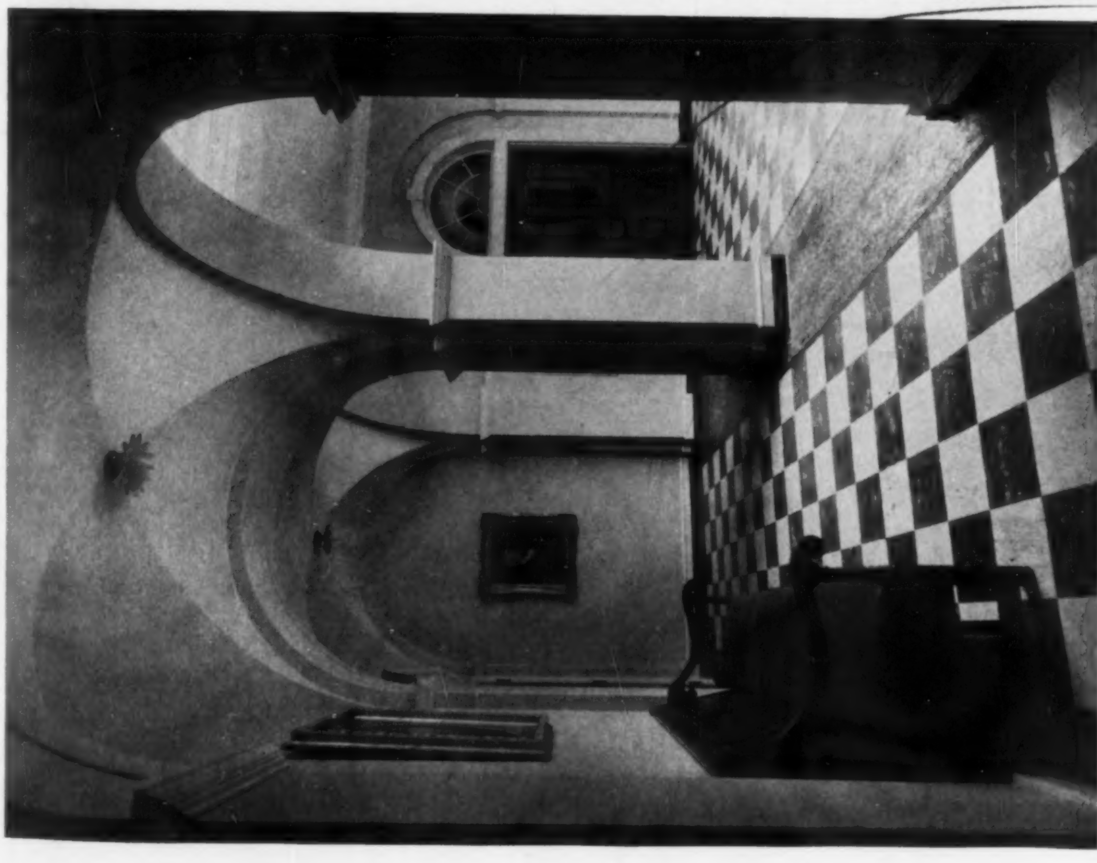
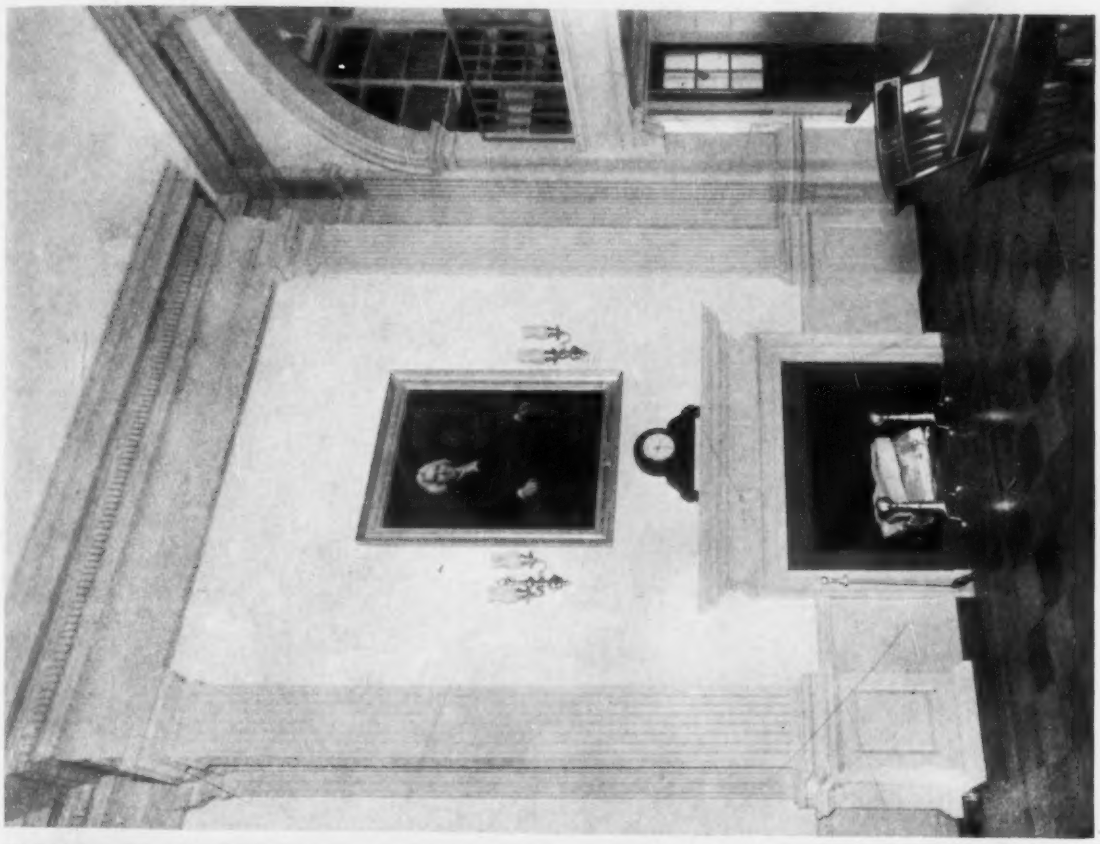
JENS FREDRICK LARSON, ARCHITECT

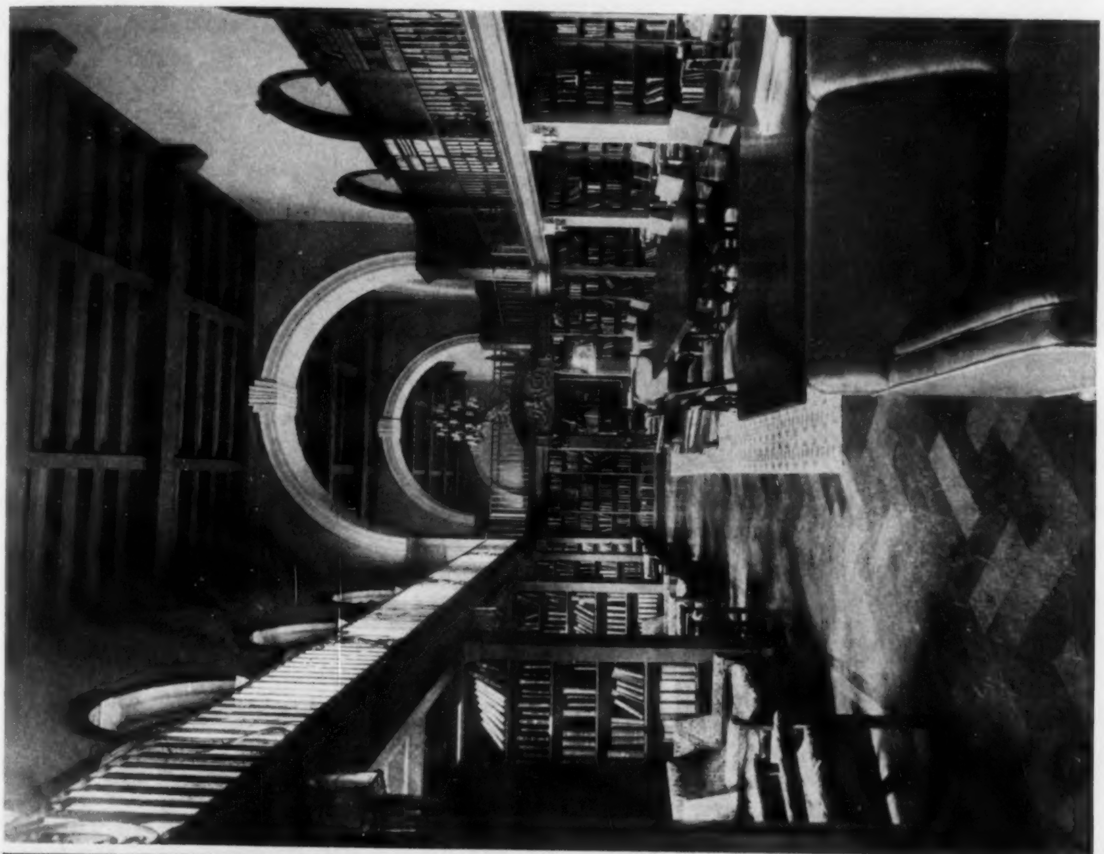


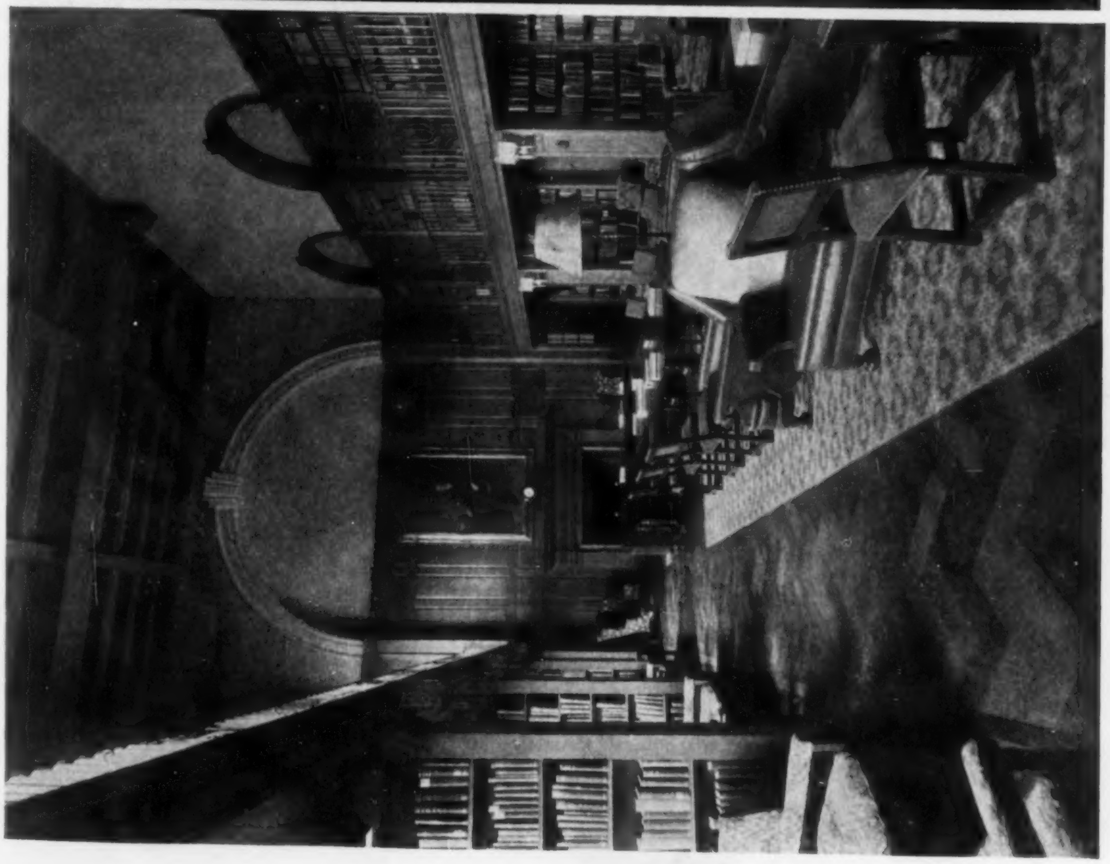
REFERENCE ROOM
BAKER MEMORIAL LIBRARY, DARTMOUTH COLLEGE, HANOVER, N. H.
JENS FREDRICK LARSON, ARCHITECT





SECOND FLOOR HALL FIREPLACE, REFERENCE ROOM
BAKER MEMORIAL LIBRARY, DARTMOUTH COLLEGE, HANOVER, N. H.
JENS FREDRICK LARSON, ARCHITECT





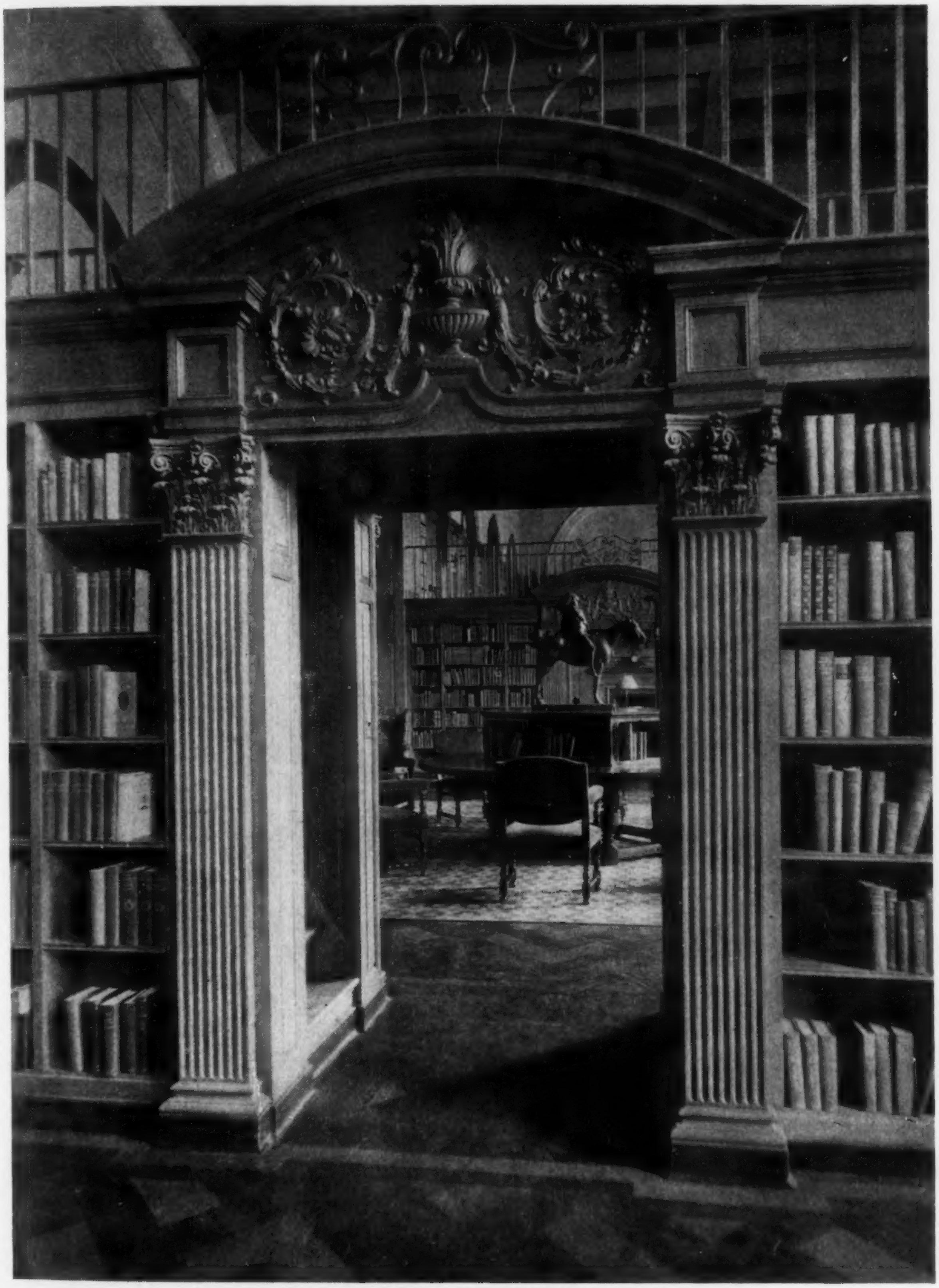
TWO VIEWS OF THE TOWER READING ROOM
BAKER MEMORIAL LIBRARY, DARTMOUTH COLLEGE, HANOVER, N. H.
JENS FREDRICK LARSON, ARCHITECT

PERIODICAL ROOM

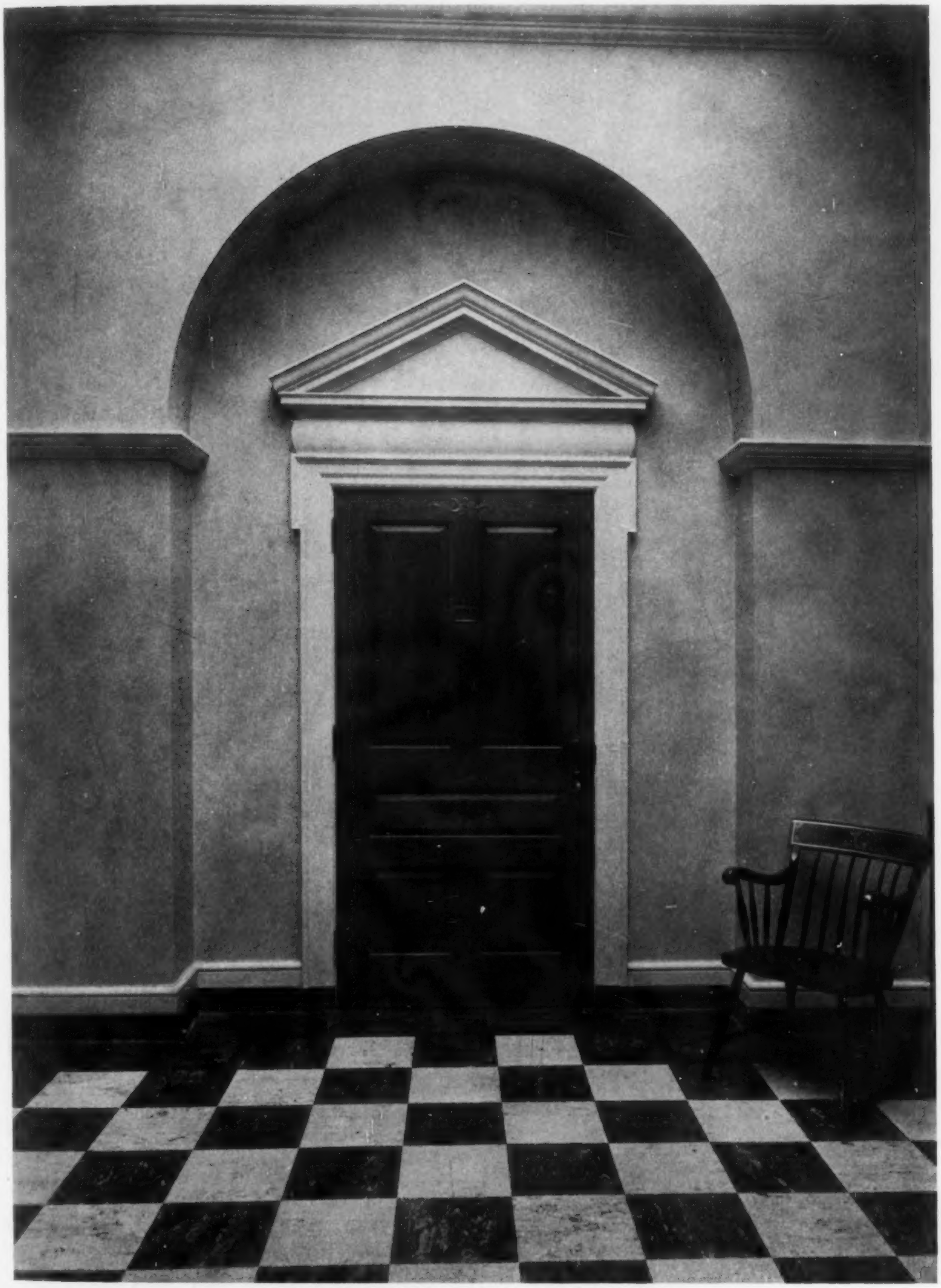
STUDY ROOM

BAKER MEMORIAL LIBRARY, DARTMOUTH COLLEGE, HANOVER, N. H.

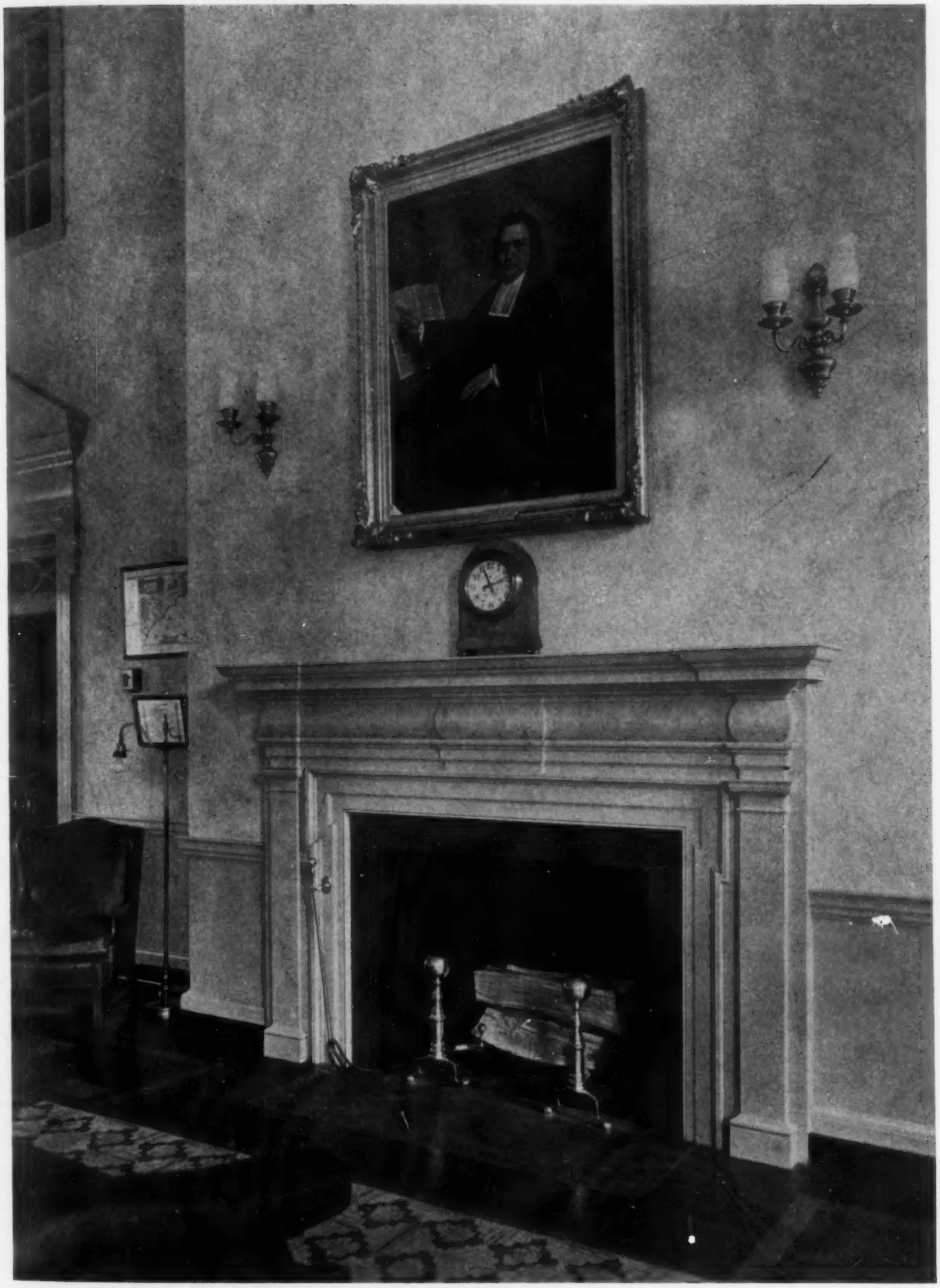
JENS FREDRICK LARSON, ARCHITECT



CENTRAL SCREEN, TOWER READING ROOM
BAKER MEMORIAL LIBRARY, DARTMOUTH COLLEGE, HANOVER, N. H.
JENS FREDRICK LARSON, ARCHITECT



DOOR TO SEMINAR ROOM, SECOND FLOOR
BAKER MEMORIAL LIBRARY, DARTMOUTH COLLEGE, HANOVER, N. H.
JENS FREDRICK LARSON, ARCHITECT



FIREPLACE IN STUDY ROOM
BAKER MEMORIAL LIBRARY, DARTMOUTH COLLEGE, HANOVER, N. H.
JENS FREDRICK LARSON, ARCHITECT

TREASURE ROOM
BAKER MEMORIAL LIBRARY, DARTMOUTH COLLEGE, HANOVER, N. H.
JENS FREDRICK LARSON, ARCHITECT

BAKER MEMORIAL LIBRARY AT DARTMOUTH COLLEGE

BY

JENS FREDRICK LARSON

ARCHITECT

DARTMOUTH COLLEGE endeavors to enable men to train themselves for constructive action guided and energized by logical and imaginative thought based on wide and accurate knowledge. The source of this knowledge is to be found in the fund of human experience preserved for the most part in printed or manuscript records. The primary function of a library, therefore, should be to make these records available as a central feature in the intellectual life of a college. This is the principle which here dominated the work of the committee and the architect in the development of the plans, but use of the records of human experience cannot be in the fullest sense effective unless it is accompanied by the stimulus to achievement derived from appreciative contemplation of the contributions to truth and beauty embodied in the recorded experience of the race.

The purpose of library planning, therefore, is to provide for the use of books and the enjoyment of books. This can be accomplished only by realizing and dividing into four major units the problem as a whole:

1. The storage and service necessary to take care of the book collection, which would include the accession, cataloguing, storage and lending of books for outside use.
2. The reading of books and periodicals and access to reference material within the library. This also could be thought of under the subdivision of required and optional reading.
3. The use of the library building for conferences and seminar work.
4. Faculty research.

Service. The first use of the Dartmouth Library, as outlined, is the storage and service end. This use is at the heart of the Library, and about it one must plan the other uses. At Dartmouth the main entrance of the building is directly to the delivery hall and desk, with service space behind it opening direct to the stacks where the service elevators, booklifts, etc., are found. This is important, as the books to the delivery desk are from the stacks direct to the borrower. The card catalogs for this service are to the right of the delivery desk in the large hall. The cataloguing room that functions with the card catalog is directly behind the card catalogs. This relationship is necessary, as is also the contact between the catalog room and the stack. To the left of the cataloguing room is the order room, where the new books are accounted for. Below the order room is the receiving room; all these rooms use the same elevator service in their relation to the stack, and this makes for economy of space.

The stack is the center of the Library plan, just as the books supply the reason for the building. It is important at this point to mention that library expansion is primarily a matter of book expansion. The stack, therefore, should have opportunity for unlimited growth. It is contemplated in this plan to extend a large stack across the north of the building, connecting the northeast and the northwest wings, increasing the stack capacity from 500,000 to 2,000,000 volumes, and in the future to whatever stack capacity is necessary, without restriction.

Reading Rooms. Having built the service end of the Library, the architect's problem was to arrange for the second use, or the reading of books, periodicals, etc., within the building. First came the problem of the reserved books which are loaned for short periods as assigned reading in class work. This was allotted to the basement or ground floor, with a delivery desk of its own. The assigned reading required reading room space within the Library, since these books must be used there. The large hall in the basement at the delivery desk point is used as a reading room for those wishing merely a quick glance at books, while the northeast and southeast reading rooms are for the full use of this material. The students are allowed to smoke in the two study rooms so that they do not need to carry the books out of the control of this floor. This makes the basement floor then, from the center into the east wings a separate unit from the rest of the Library, though it has, as elsewhere, direct contact with the stack for the obtaining of book material. The next use of books is on the first floor in the northeast wing, which is for reference material. Here information on a definite subject is sought, but as the reader does not know exactly where it is to be found, he needs the opportunity of consulting bibliographical aids and of obtaining the assistance of someone experienced in the use of those aids. The reference librarian's office is between the reference room and the periodical room on the axis of the large entrance hall.

The problem of the periodical room was difficult. Libraries have different methods of housing their periodicals. Here the architect carefully analyzed each in turn, and the conclusion was that he would rather have a room more architecturally charming than most of those which were seen. The periodicals are housed in cases between the

Reproduction of Original Dartmouth College Library

windows, forming alcoves. The periodicals are kept on open shelves in these cases, with tables at the center of the room for comfortable study. In this way it is possible to house an assortment of over a thousand different periodicals in a highly attractive manner, so that their use is more frequent than in a more formal or systematic scheme. On this floor there is also provided in the southwest wing a study room for such students as find it difficult to study in their dormitories or fraternity houses. It is informally furnished for the purpose of study. There are tables of varying sizes at the center of the room, with small tables for two men each between the windows. There is some lounge furniture in this room to take off the formality of the reading room. It is quite simple in architectural character, a fireplace at the north end of the room adding materially to its interest.

The "treasure room" in the northwest wing with the archives room under it is where the valuable book material of the College is kept behind grilled doors. This room was a class gift and has some very interesting features. The windows have leaded glass inner sash with various seals and medallions of the College, and in the small panes are illustrations from photographs burned into the glass to give a permanent record of the class. The class records are kept in a secret compartment in the room under the control of the class secretary.

On the second floor over the delivery hall is a large room divided into three units. This is really the browsing room in literature. Here there has been created a room more like a reading room of a large club, with fireplaces, very comfortable chairs and beautiful furniture. The walls are oak paneled, with a gallery over the alcoves. Each alcove is given over to books of special interest to the various departments. These books are of the more popular type and are there to tempt the students to read books in fields other than those in which they are majoring. The custodian of this room is an interpreter of books and an aid to the students in their digressions. The most interesting feature of this room, architecturally, is the entrance through doors underneath the gallery. The object here is to make it the end of a journey, and the effect of the small doors under the gallery is to make the room very much quieter. The fireplaces are placed at the ends of the room where normally large monumental entrances would have been. The room would then, of course, have been a hallway. This room is ex-

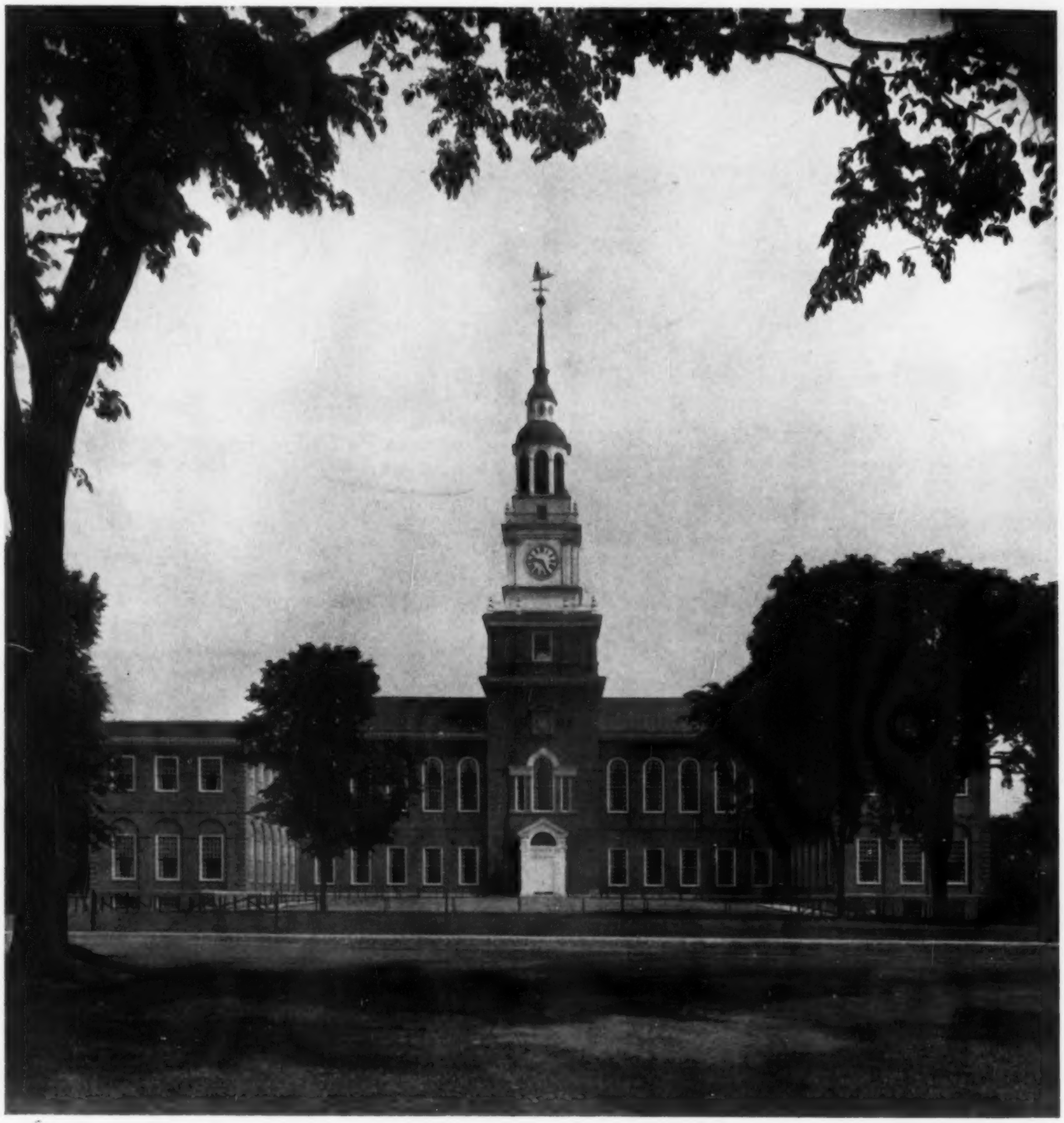
Entrance to Reproduction of Original Dartmouth College Library

tensively used by the students and faculty. It is serving its purpose and has proved a very worthwhile investment for the College. The stack is also used for the reading of books. It is open to the students at large. Tables have been provided at the windows for the reading of books in the stack. The architect was careful to plan the stack to give a large window capacity for examination of books. Giving access to the open stack is a very important policy in the use of the Library at Dartmouth, and it works successfully.

Conference and Seminar Rooms. The use of the Library for conferences and seminar work was necessary to bring the faculty and students together for conferences with books under the most satisfactory conditions. As the College works on a departmental basis, it was thought advisable to provide centers with books pertinent to their courses. The seminar rooms are for larger groups numbering up to 15, while the conference rooms are for smaller units of not more than eight students. These rooms are carefully scheduled for time and use, and are serving their purpose.

Faculty Research. Provision for faculty research and for creative work where the source of inspiration is books has been taken care of by providing small rooms 8 feet square off the stack proper on four of the book levels. These are allotted to the members each semester, and an attempt is made to place them as near as possible the books they wish to use. These rooms are very carefully planned for isolation. A locked door leads to a corridor from which open the offices. They are not provided with telephones or any other means of interruption. The purpose, as just said, is to allow the faculty to work without interruptions. There are 56 of these offices, and they are always in demand. In conclusion, the Library has been planned around the expected needs of Dartmouth College, and is functioning adequately.

At the dedication the librarian said that every achievement of the human spirit is based chiefly on faith, and that those who planned this Library planned it with faith, and worked into its very fabric certain beliefs which none can prove. They believed that more and more Dartmouth College will teach that all things interlock about a central reality,—therefore they planned so to place the building that it be at the heart of the campus, yet so that related buildings could be grouped about it; to draw in all the books of the College; to keep the books for the most part central in the building, not dispersed. They believed that to surround young men with beauty is good,—a part of their education. Therefore of certain rooms the design, color and furnishings were studied as prob-



View from Campus

lems in the creation of beauty. They believed that students should be given a chance to acquire the habit of reading, as a resource for leisure, as the surest way to retain a keen and useful mind; therefore, the Tower Reading Room,—an experiment in the cultivation of the reading habit. No rules or restrictions are posted here. It is assumed that the room and its contents will be regarded as one would the library of one's club. It is possible that in after years some students may feel that in this room were spent some of the most valued hours of their college life. Now and then during the winter, poetry or prose is read aloud here by members of the faculty, with lights dim, the fire glowing, and coffee served in the background. By day the great windows look down upon the campus. If the library is in some sense the heart of the college, this room is the heart of the library. It is a place for the storage, distribution and use of books, and beyond that it is a place which will cultivate the love of books and the love of beauty. Of the background of these beliefs,—of a central reality, of beauty, of the best of the heritage of the past, the tower is the symbol,—for Dartmouth an inspiration; for the world, a sign. The building fits well into the collegiate group of which it is an important part, the group contributing much to the town's interest.

THE 1928 COMMON BRICK SCHOOL COMPETITION
STATEMENT OF THE JURY OF AWARD

ABOUT half of the 52 schools submitted did not, in our judgment, rise to the standard in schoolhouse design which the competition would seem to merit. This portion of the entries could hardly be called representative of the best work done by the architects of the country, and it is evident that many architects responsible for the best in schoolhouse design did not participate. Many of the designs, however, evidence a clear understanding and a serious study of the problem, and show that restraint which is always the charm of good architecture and design.

After careful consideration of all the schools submitted in the competition, we have selected for the grand prize the design entered by Henry Y. Shaub, of Lancaster, Pa., being that for the Junior High School of Upper Leacock Township, Leola, Pa. This building is representative of schools for smaller communities which, after all, is the type in schoolhouse planning that has been least developed. This school may safely be taken as a model building for the small community. Its plan is simple, giving maximum opportunity for those diversified school and community uses which is so necessary when funds are limited. This entry possesses a charm that is rarely found in buildings of this kind. This same building was awarded the first prize in Class A of the competition for smaller buildings.

The plan awarded the first prize in Class B, representing the larger buildings, is that of Davis, Dunlap & Barney, Philadelphia, being the Cheltenham High School, Elkins Park, Pa. This building was selected for the reason that it typifies the correct use of architectural precedent when applied to modern buildings. The architects have successfully fitted their building to the site conditions. The designs selected for recognition are:

CLASS A

1st Prize—Henry Y. Shaub, Lancaster, Pa. Upper Leacock Township Junior High School, Leola, Pa.

2nd Prize—G. Howard Chamberlin, Yonkers, N. Y. Public School No. 11, Yonkers, N. Y.

3rd Prize—Victor Galbraith, Stockton, Cal. Harmony Grove School, San Joaquin Co., Cal.

1st Mention—Eric G. Flannagan, Henderson, N. C. Halifax Public School, Halifax County, N. C.

2nd Mention—Victor Galbraith, Stockton, Cal. Davis School, San Joaquin Co., Cal.

3rd Mention—Frederick S. Stott, Omaha, Neb. Oakdale School, Douglas County, Neb.

4th Mention—Coffin & Coffin, New York, N. Y. Glenwood Landing School, Glenwood Landing, N. Y.

Extra Mention—Charles G. Loring, Boston. High School, Stoughton, Mass.

CLASS B

1st Prize—Davis, Dunlap & Barney, Philadelphia. Cheltenham High School, Elkins Park, Pa.

2nd Prize—Dean & Dean, Sacramento, Cal. Leland Stanford Elementary School, Sacramento, Cal.

3rd Prize—Palmer Rogers, New York. Northside High School, Corning, N. Y.

1st Mention—Wesley Sherwood Bessell, New York. Flower Hill School, Port Washington, N. Y.

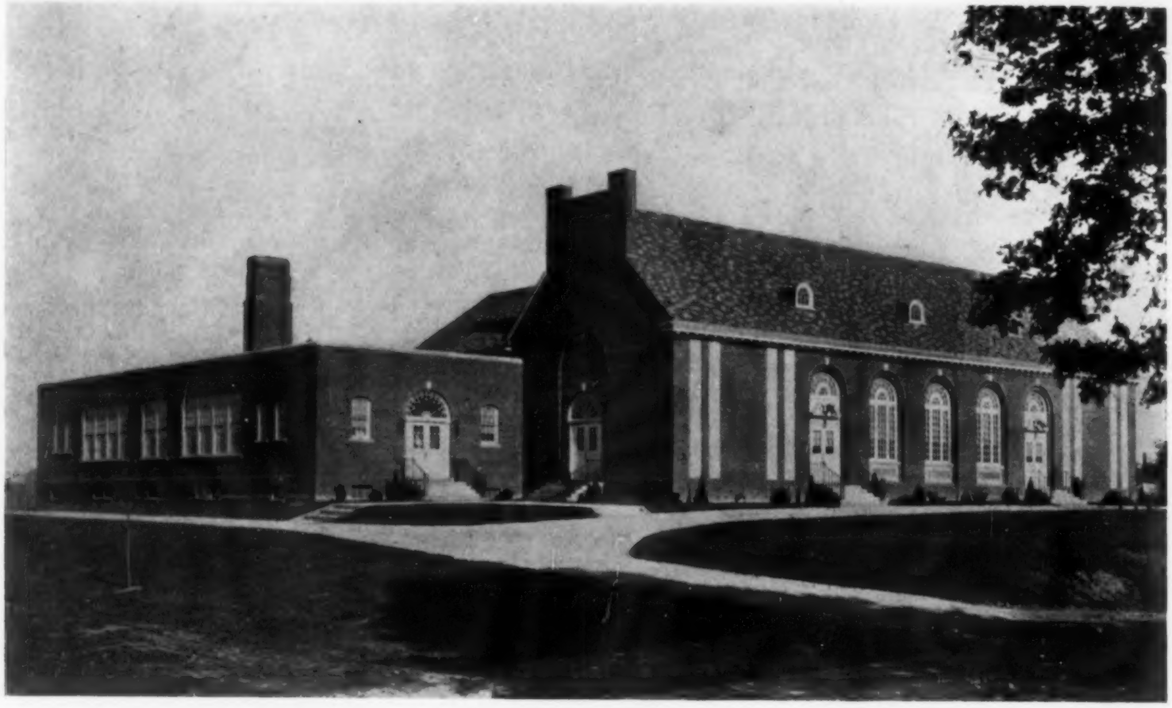
2nd Mention—Coffin & Coffin, New York. Locust Valley School, Locust Valley, N. Y.

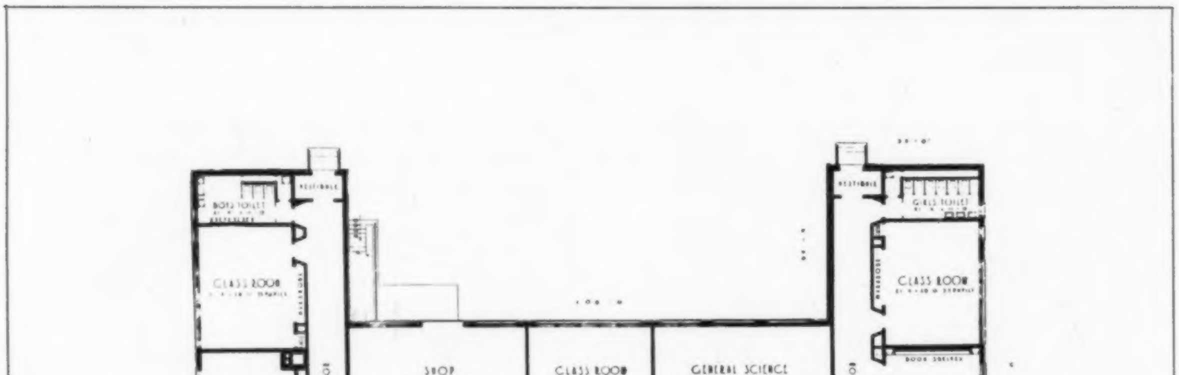
3rd Mention—Eliel Saarinen, Bloomfield Heights, Mich. Cranbrook School, Bloomfield Hills, Mich.

4th Mention—Dean & Dean, Sacramento, Cal. Sacramento Junior College, Sacramento, Cai.

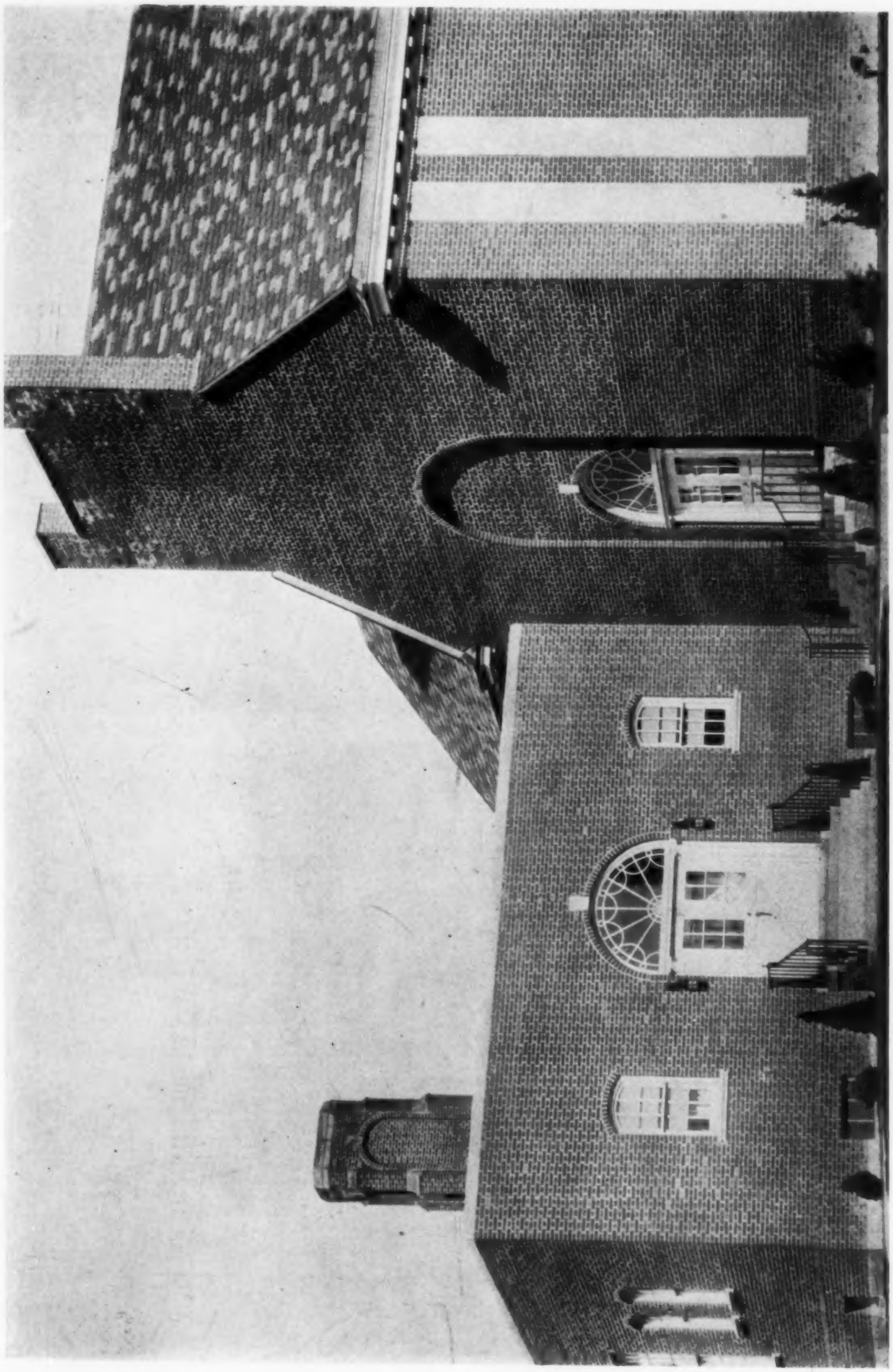
Extra Mention—Blaine & Olson, Oakland, Cal. W. P. Frick School, Oakland, Cal.

WILLIAM B. ITTNER, JR., J. O. BETELLE, W. R. McCORNACK.





FIRST PRIZE, CLASS A, AWARDED TO HENRY Y. SHAUB, ARCHITECT, LANCASTER, PA.
UPPER LEACOCK TOWNSHIP JUNIOR HIGH SCHOOL, LEOLA, PA.



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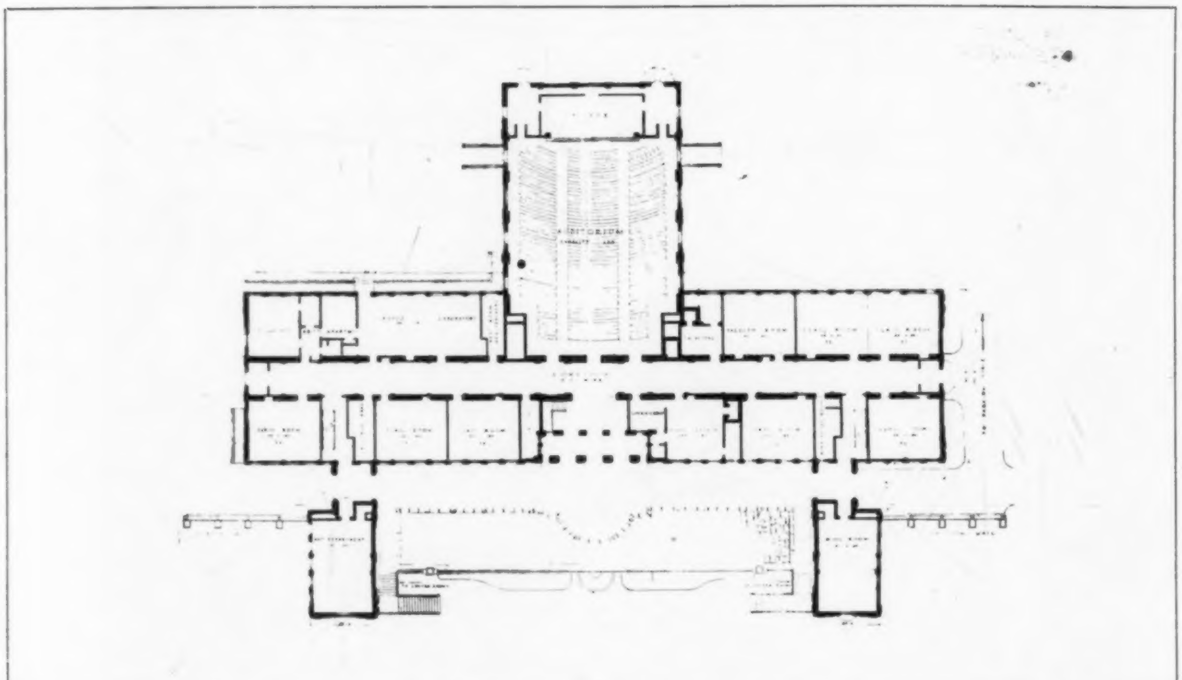
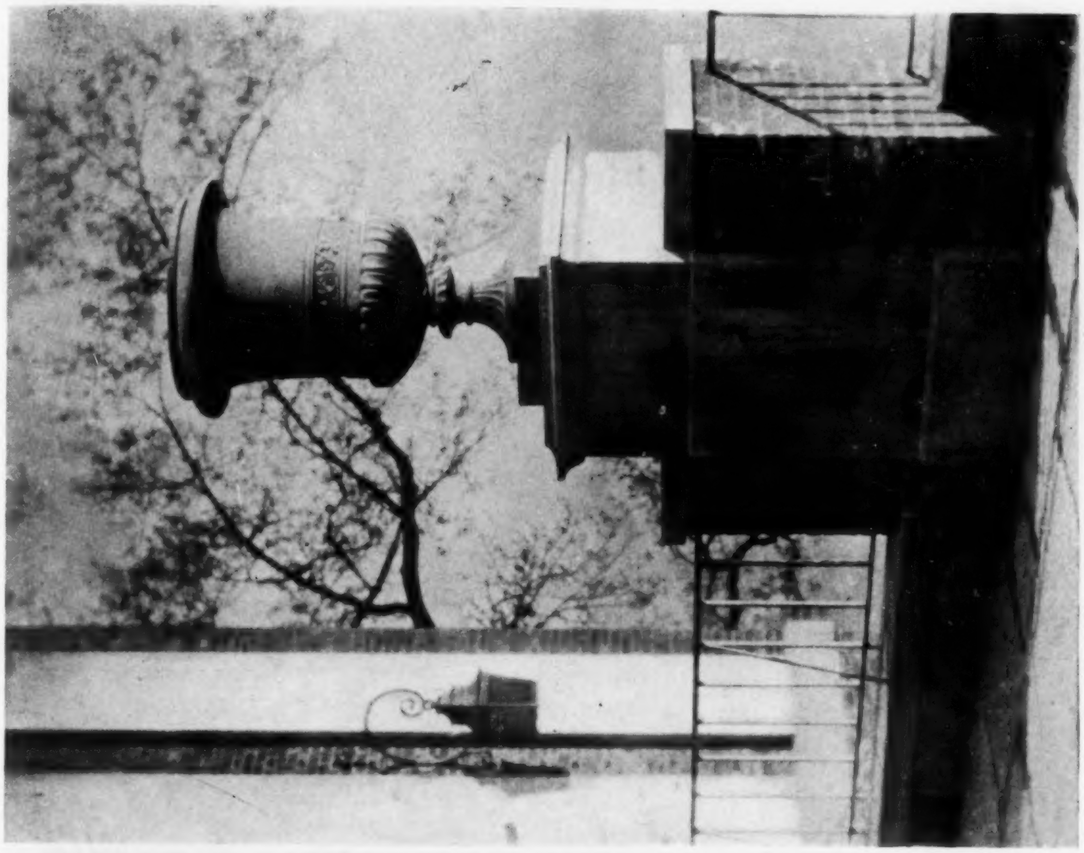
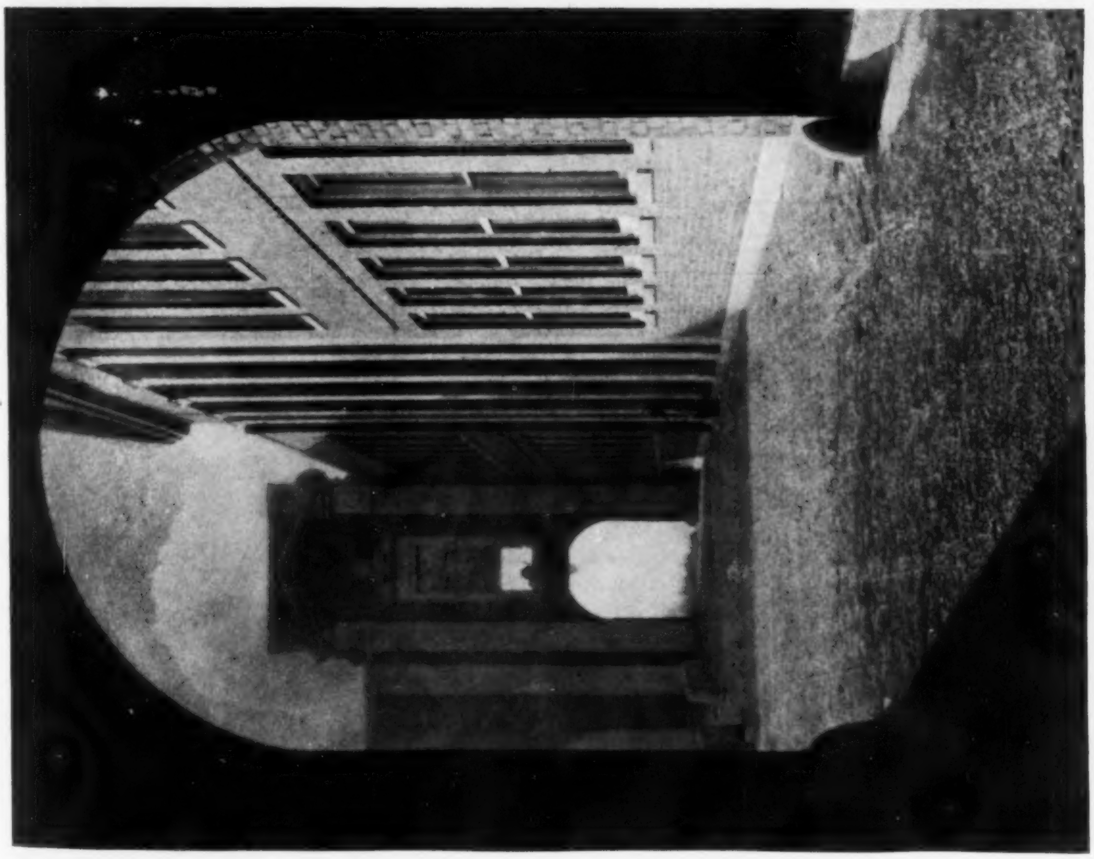


FIRST PRIZE, CLASS B, AWARDED TO DAVIS, DUNLAP & BARNEY, ARCHITECTS. PHILADELPHIA

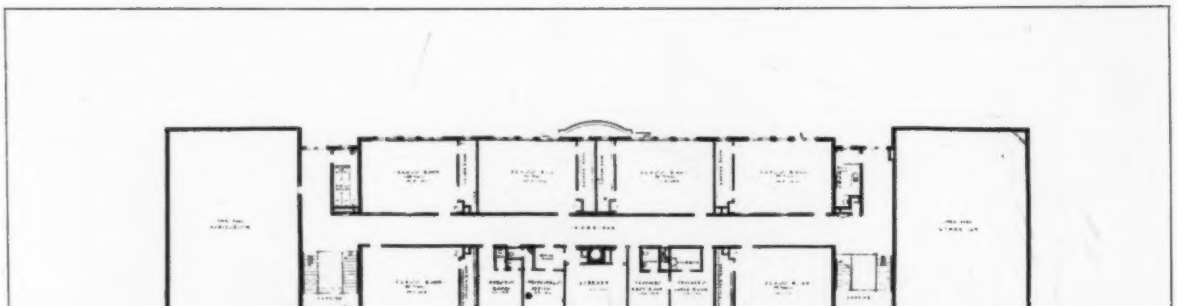
CHELTENHAM HIGH SCHOOL, ELKINS PARK, PA.





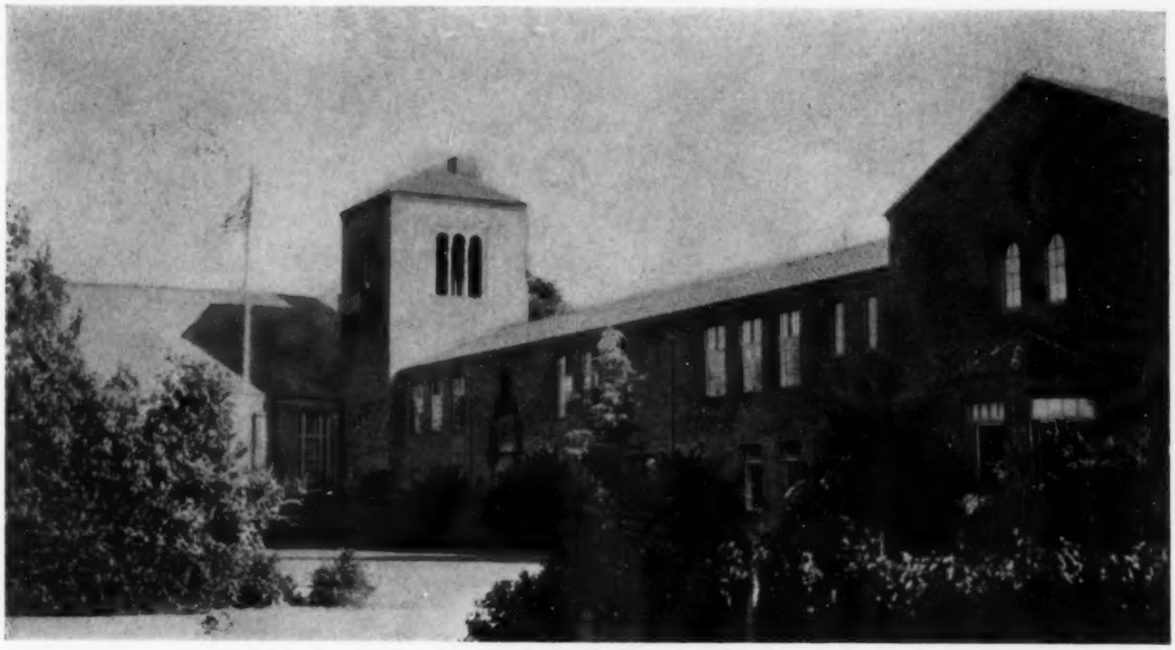
FIRST PRIZE, CLASS B, AWARDED TO DAVIS, DUNLAP & BARNEY, ARCHITECTS, PHILADELPHIA

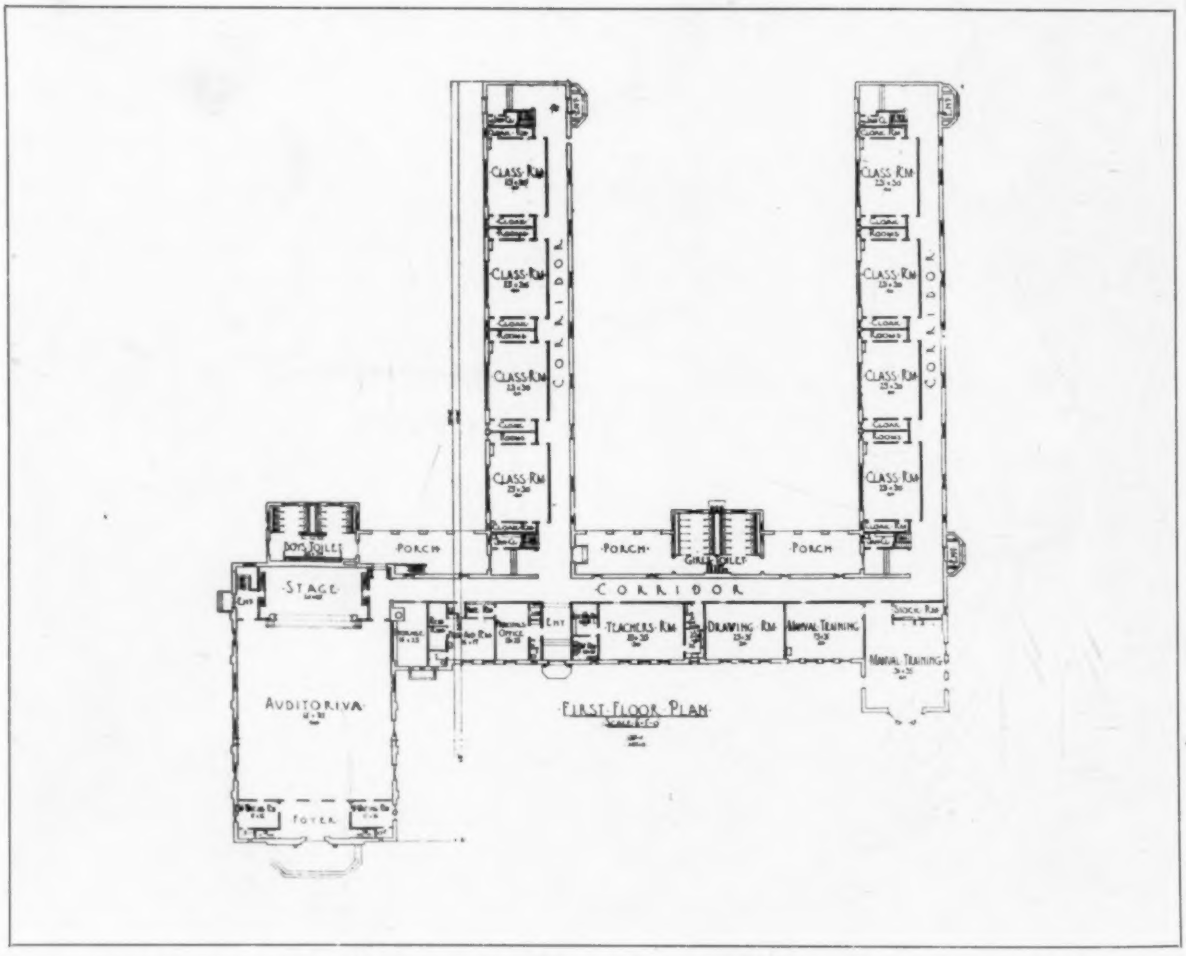
CHELTENHAM HIGH SCHOOL, ELKINS PARK, PA.



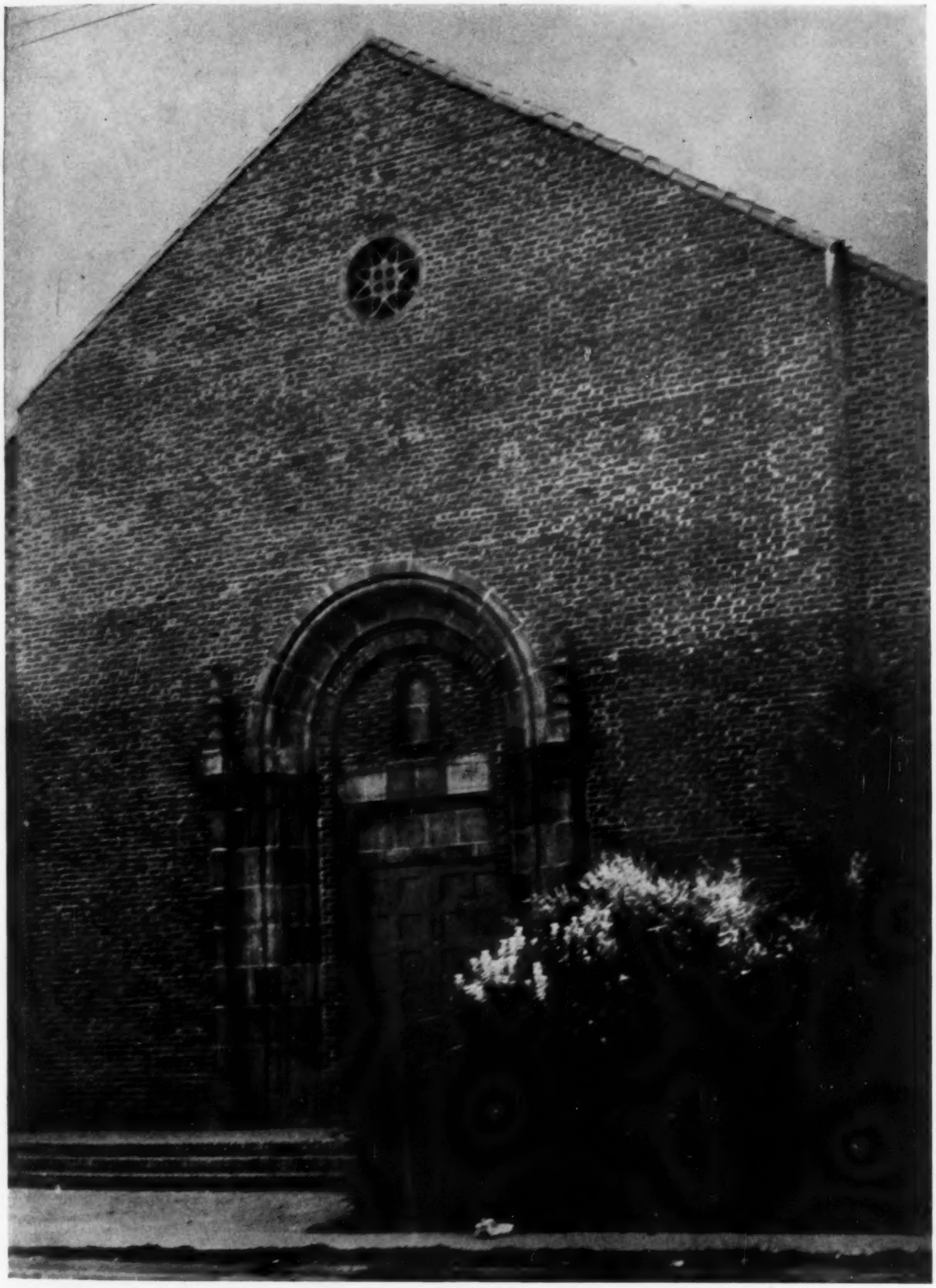
SECOND PRIZE, CLASS A, AWARDED TO G. HOWARD CHAMBERLIN, YONKERS, N. Y.
PUBLIC SCHOOL NO. 11, YONKERS, N. Y.

SECOND PRIZE, CLASS A, AWARDED TO G. HOWARD CHAMBERLIN, ARCHITECT, YONKERS, N. Y.
PUBLIC SCHOOL NO. 11, YONKERS, N. Y.

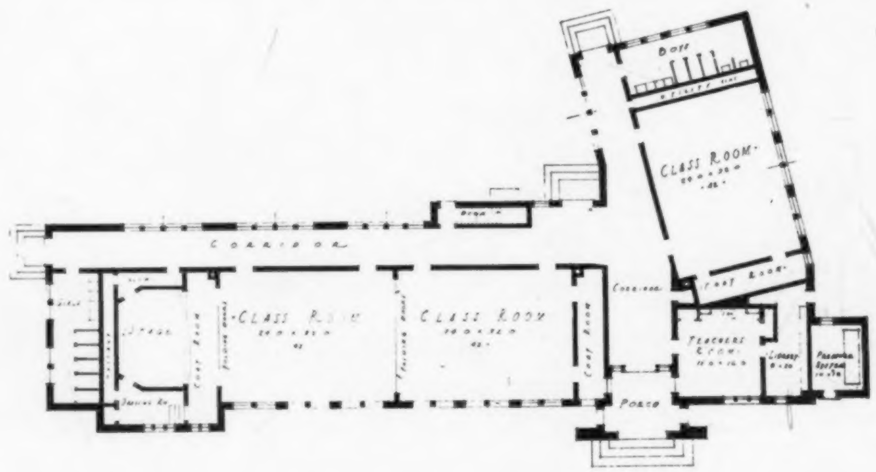




SECOND PRIZE, CLASS B, AWARDED TO DEAN & DEAN, ARCHITECTS, SACRAMENTO
LELAND STANFORD ELEMENTARY SCHOOL, SACRAMENTO

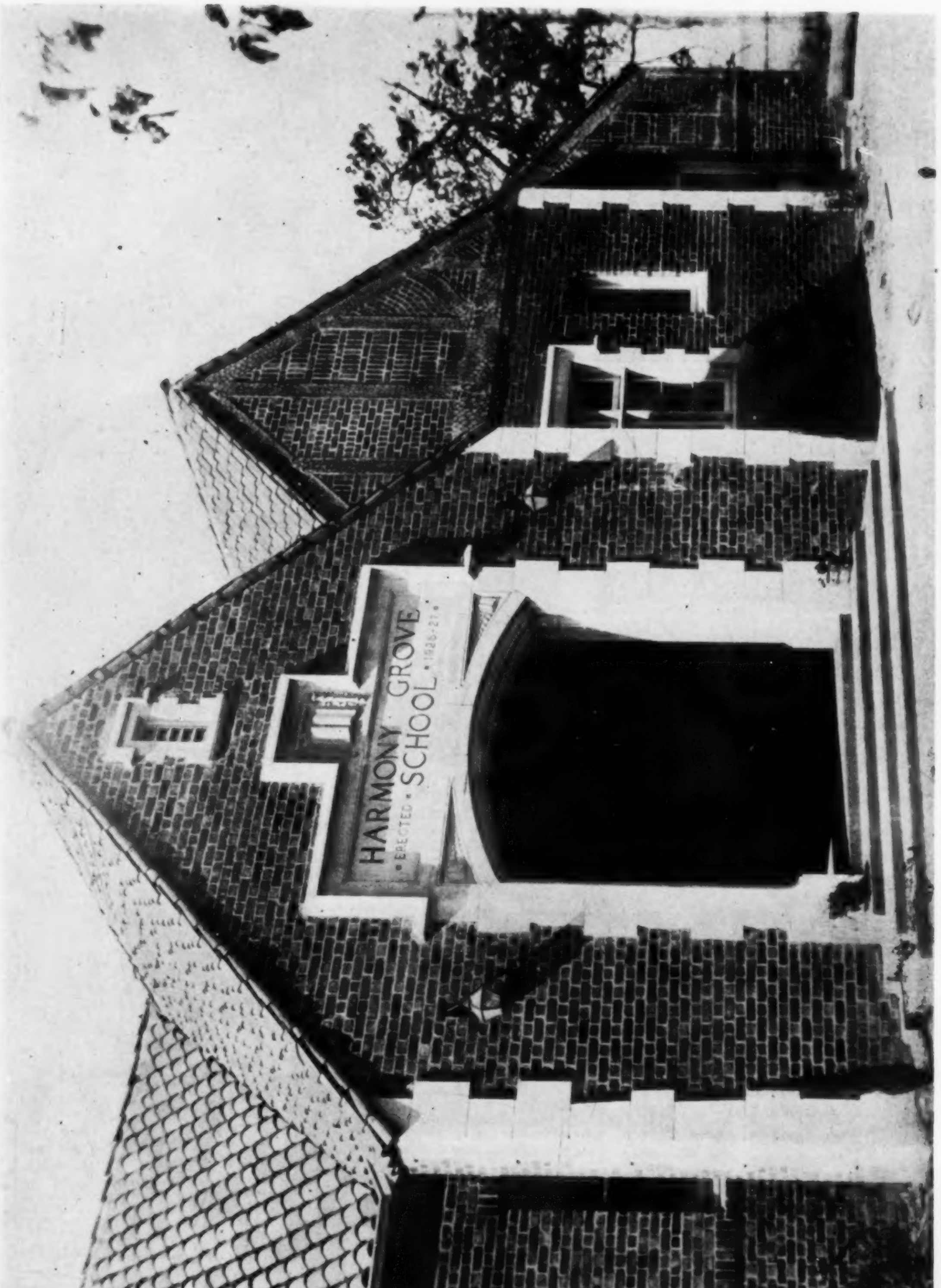


SECOND PRIZE, CLASS B, AWARDED TO DEAN & DEAN, ARCHITECTS, SACRAMENTO
LELAND STANFORD ELEMENTARY SCHOOL, SACRAMENTO

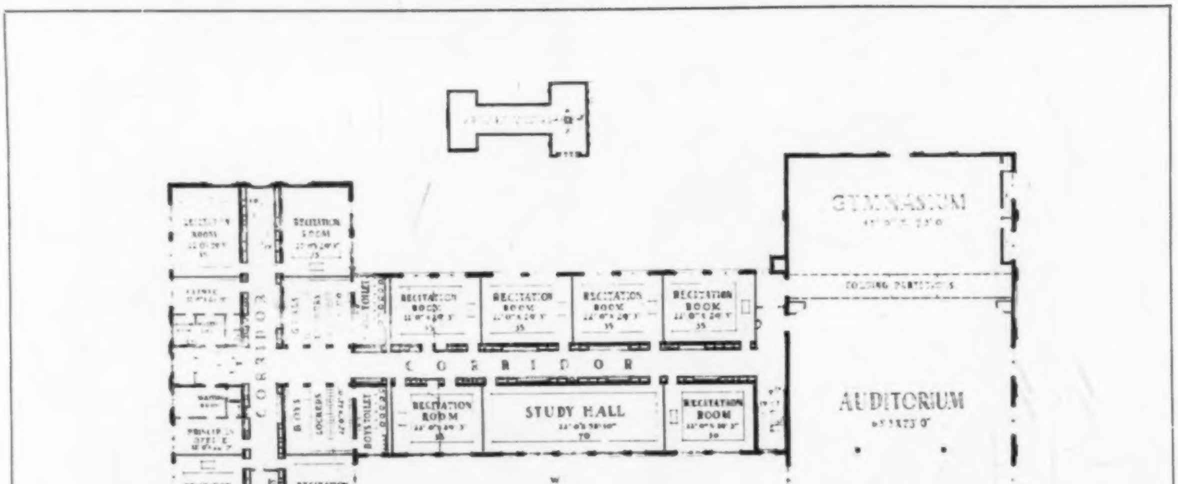


THIRD PRIZE, CLASS A, AWARDED TO VICTOR GALBRAITH, ARCHITECT, STOCKTON, CAL.

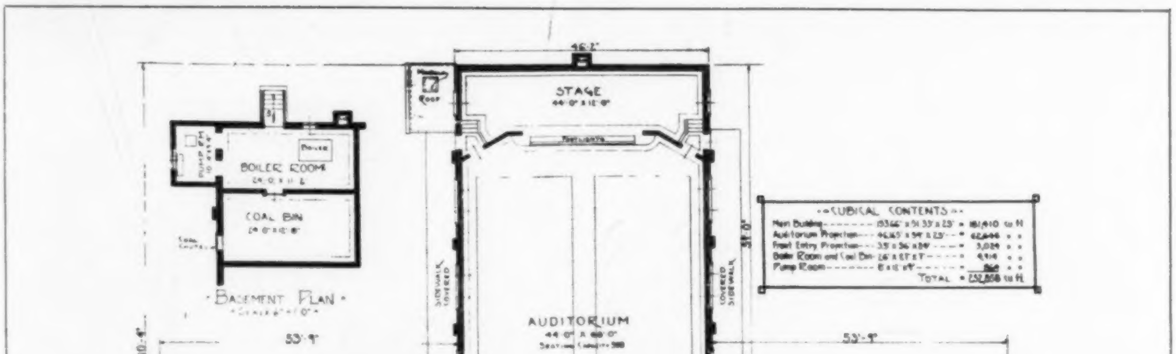
HARMONY GROVE SCHOOL, SAN JOAQUIN COUNTY, CAL.



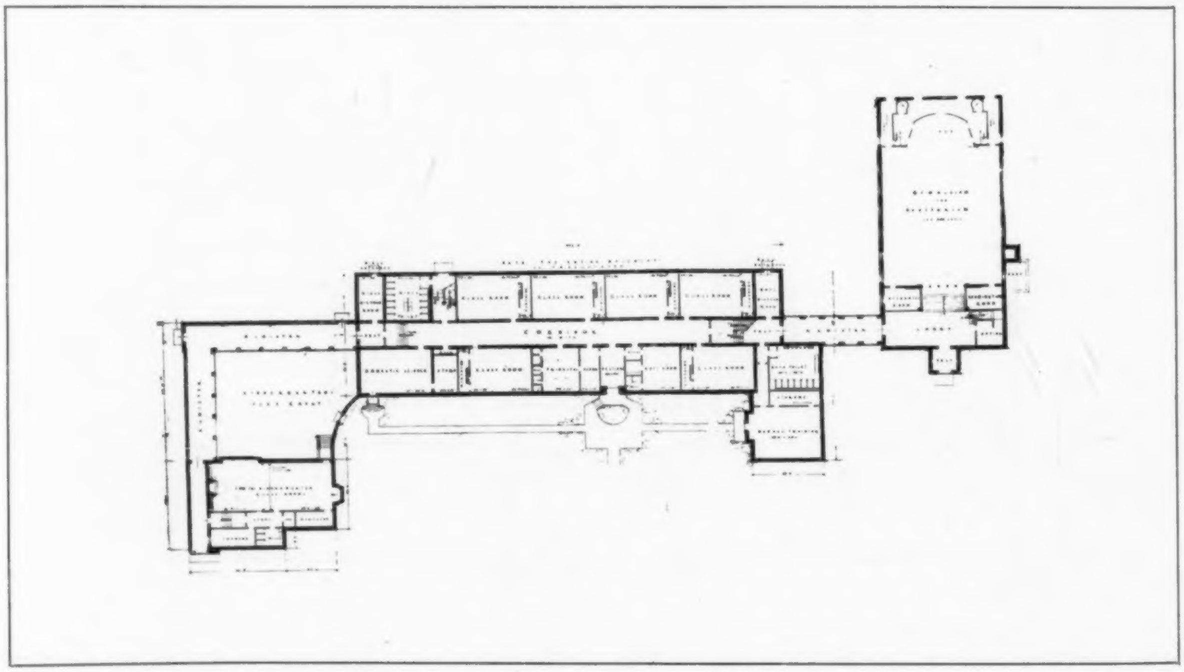
THIRD PRIZE, CLASS A, AWARDED TO VICTOR GALBRAITH, ARCHITECT, STOCKTON, CAL.*
HARMONY GROVE SCHOOL, SAN JOAQUIN COUNTY, CAL.



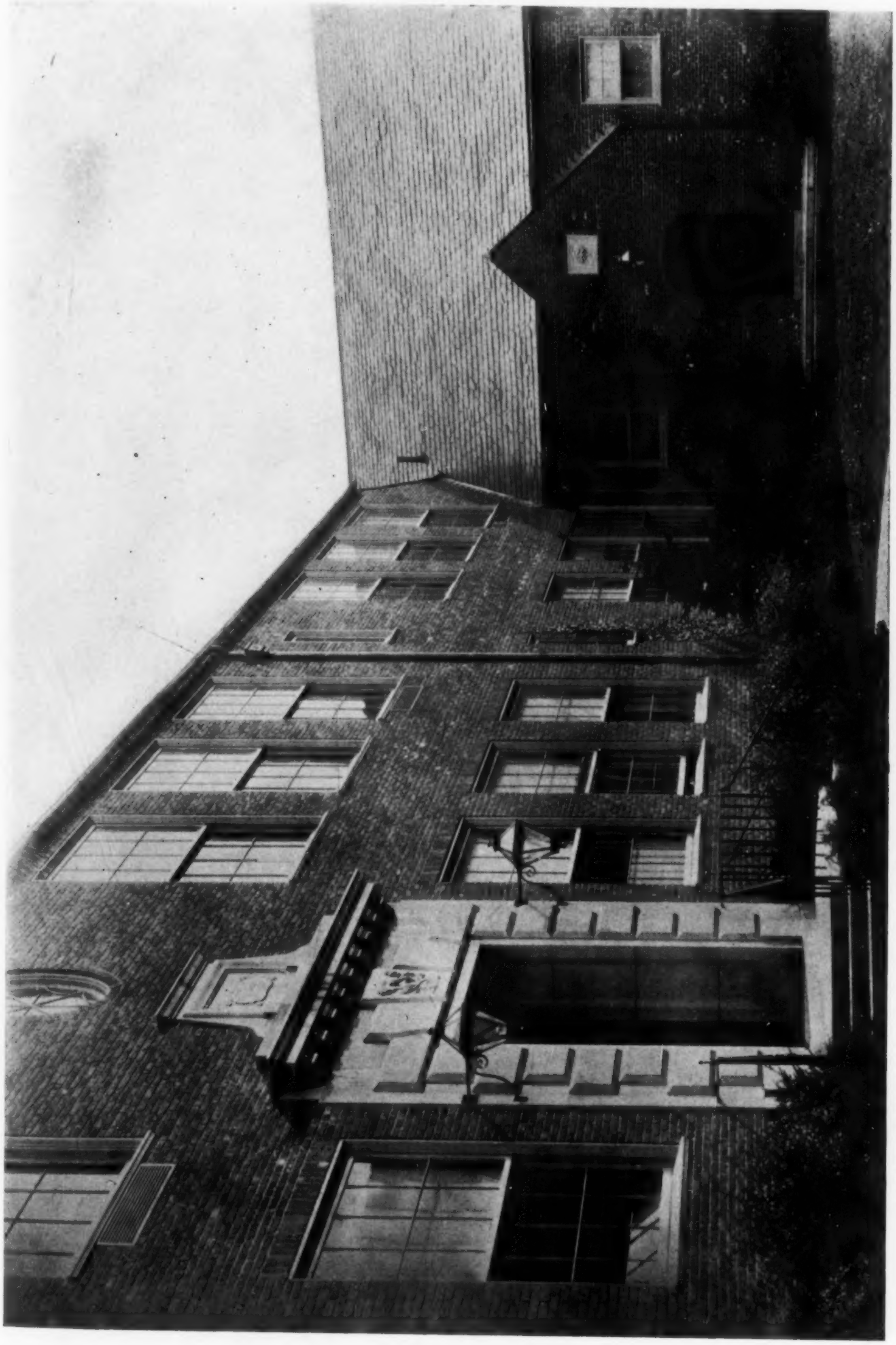
THIRD PRIZE, CLASS B, AWARDED TO PALMER ROGERS, ARCHITECT, NEW YORK
NORTHSIDE HIGH SCHOOL, CORNING, N. Y.



FIRST MENTION, CLASS A, AWARDED TO ERIC C. FLANNAGAN, HENDERSON, N. C.
HALIFAX PUBLIC SCHOOL, HALIFAX COUNTY, N. C.



FIRST MENTION, CLASS B, AWARDED TO WESLEY SHERWOOD BESSELL, NEW YORK
FLOWER HILL SCHOOL, PORT WASHINGTON, N. Y.



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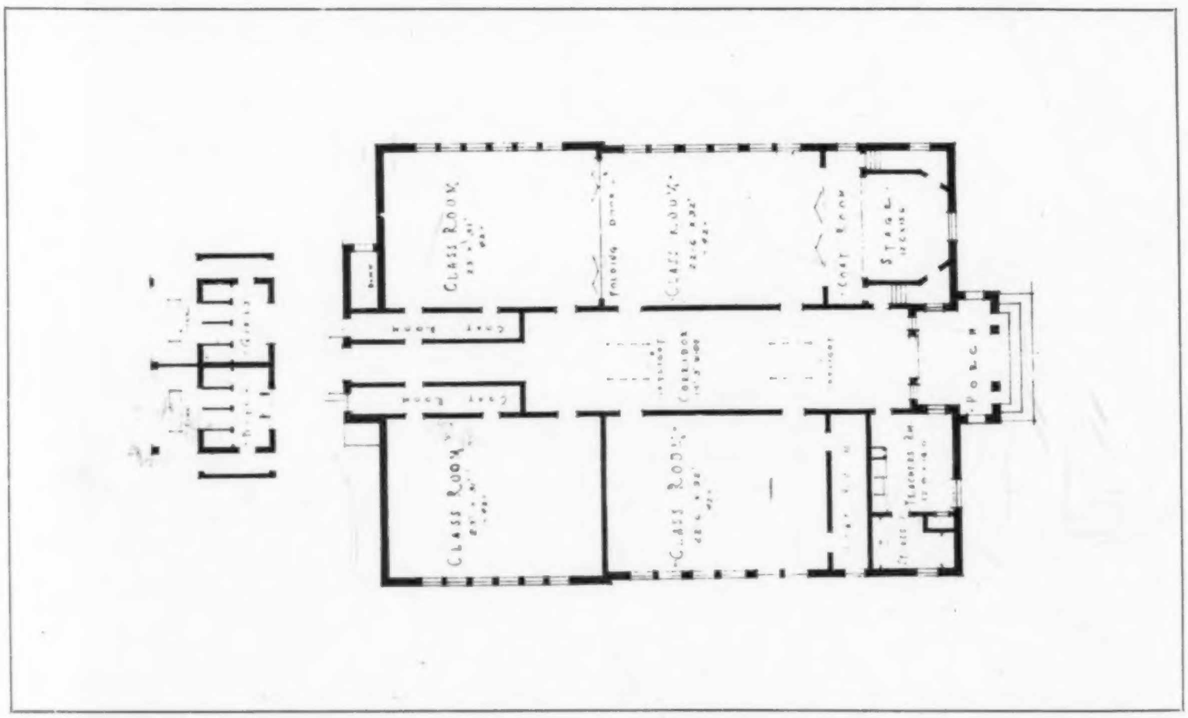

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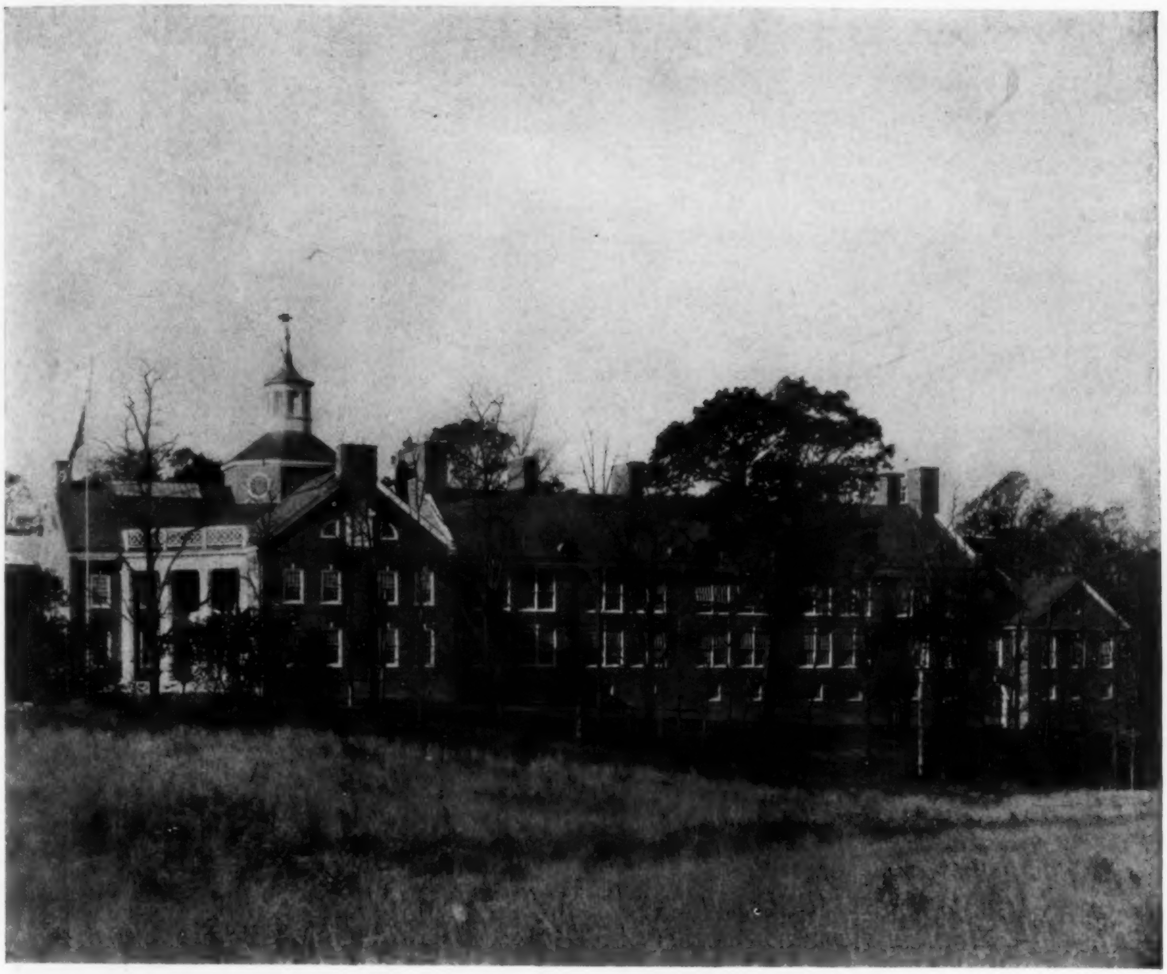
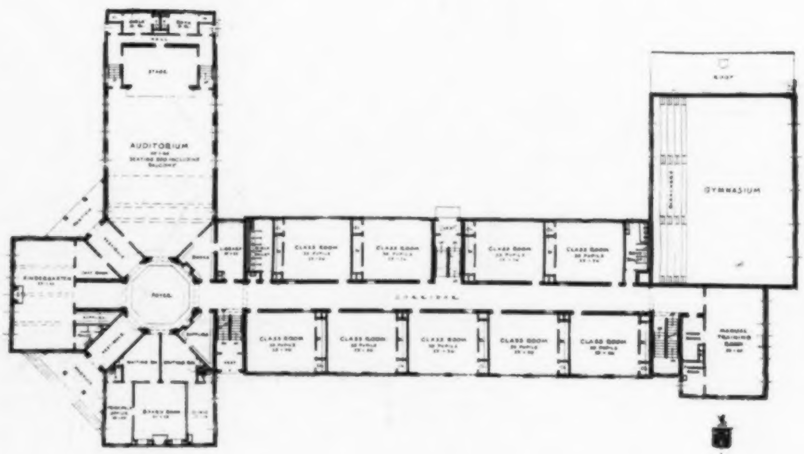
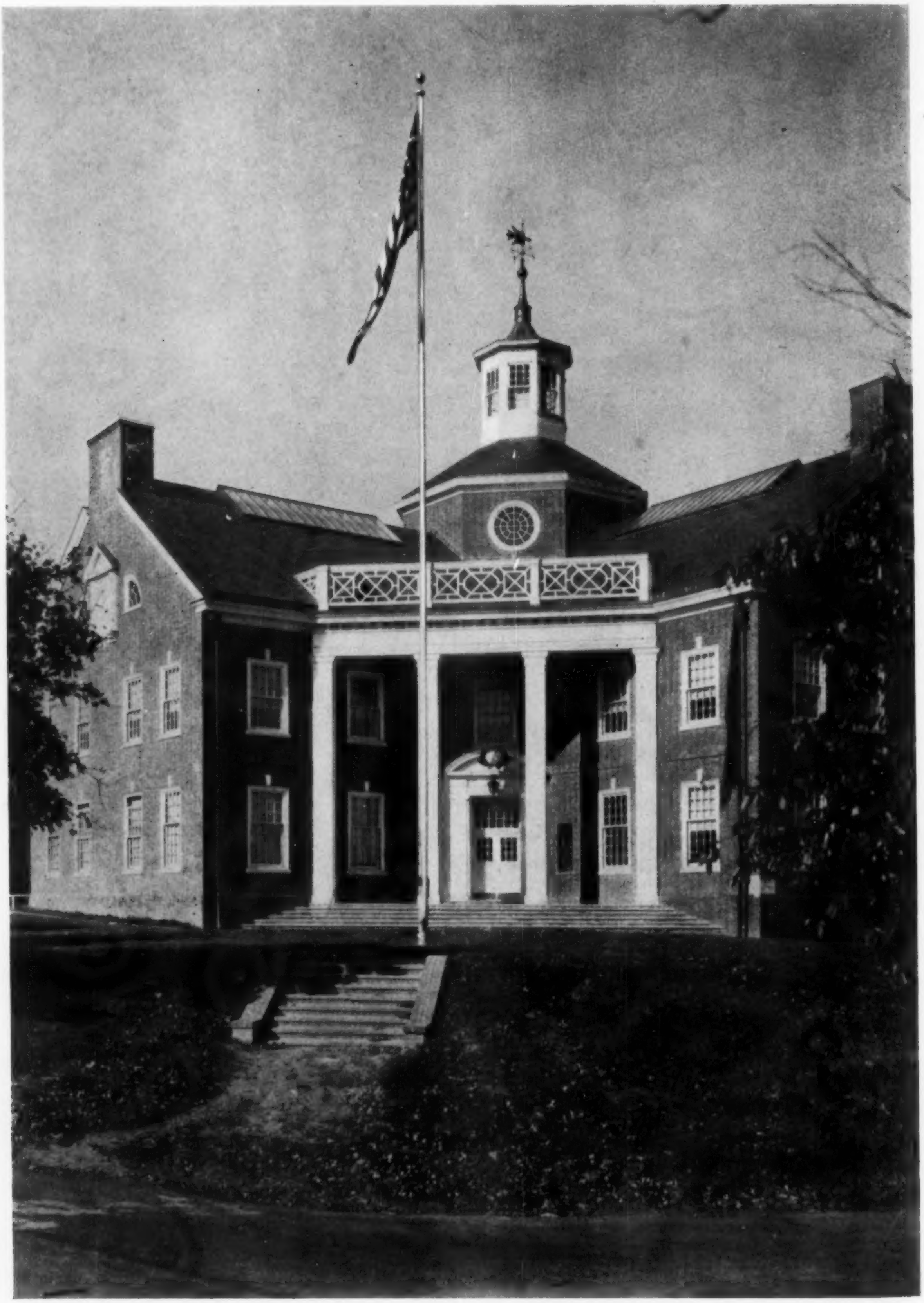
DAVIS SCHOOL, SAN JOAQUIN COUNTY, CAL.





SECOND MENTION, CLASS B, AWARDED TO COFFIN & COFFIN, ARCHITECTS, NEW YORK
LOCUST VALLEY SCHOOL, LOCUST VALLEY, N. Y.



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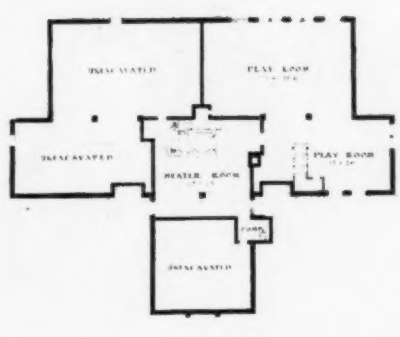
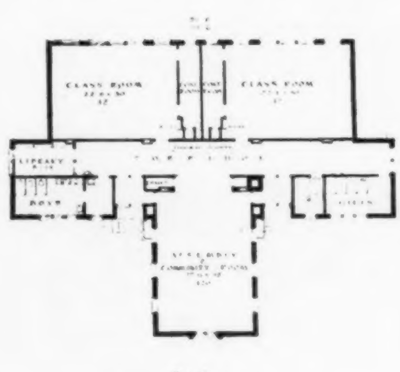
LOCUST VALLEY SCHOOL, LOCUST VALLEY, N. Y.

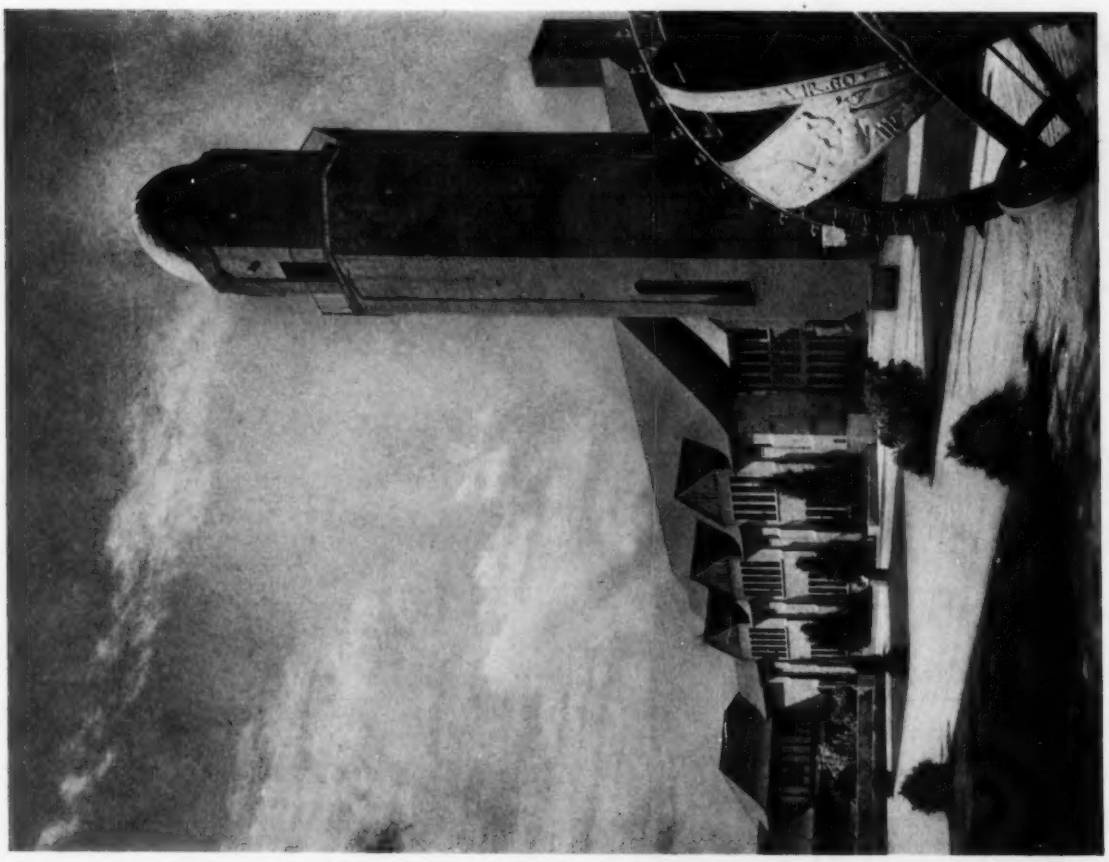


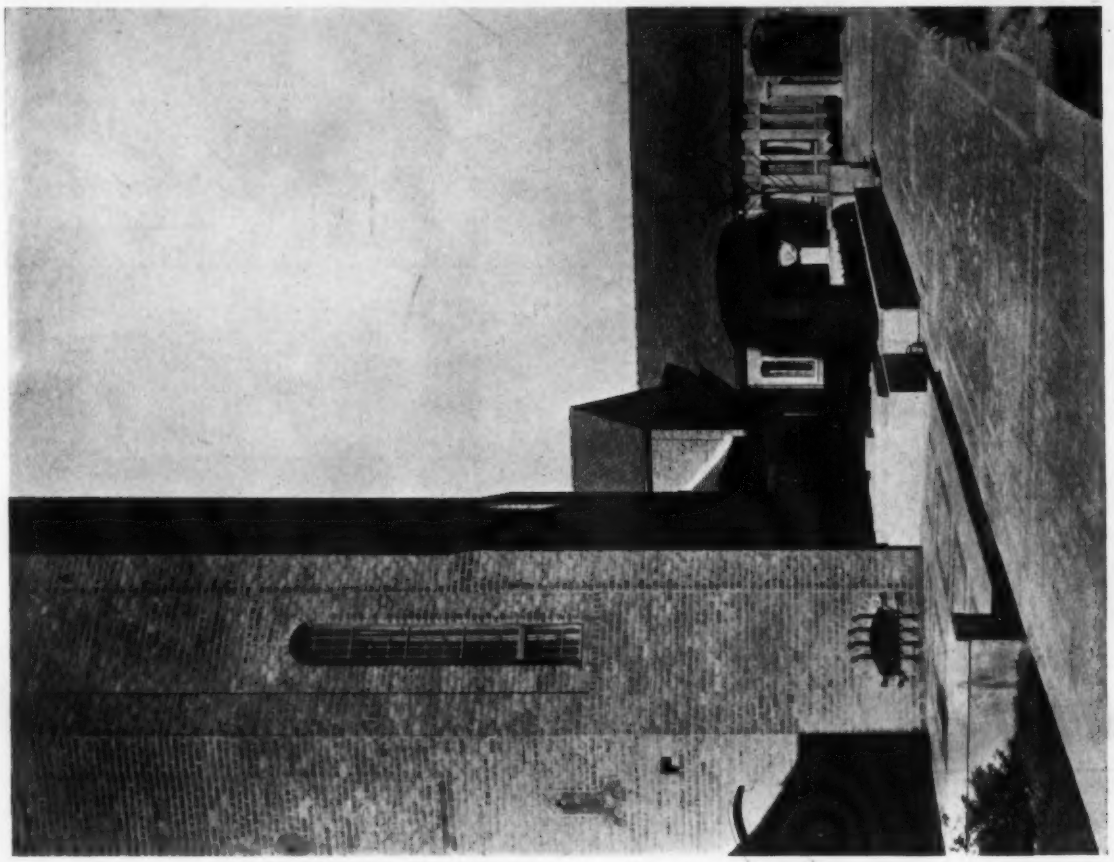
BASEMENT



FIRST FLOOR

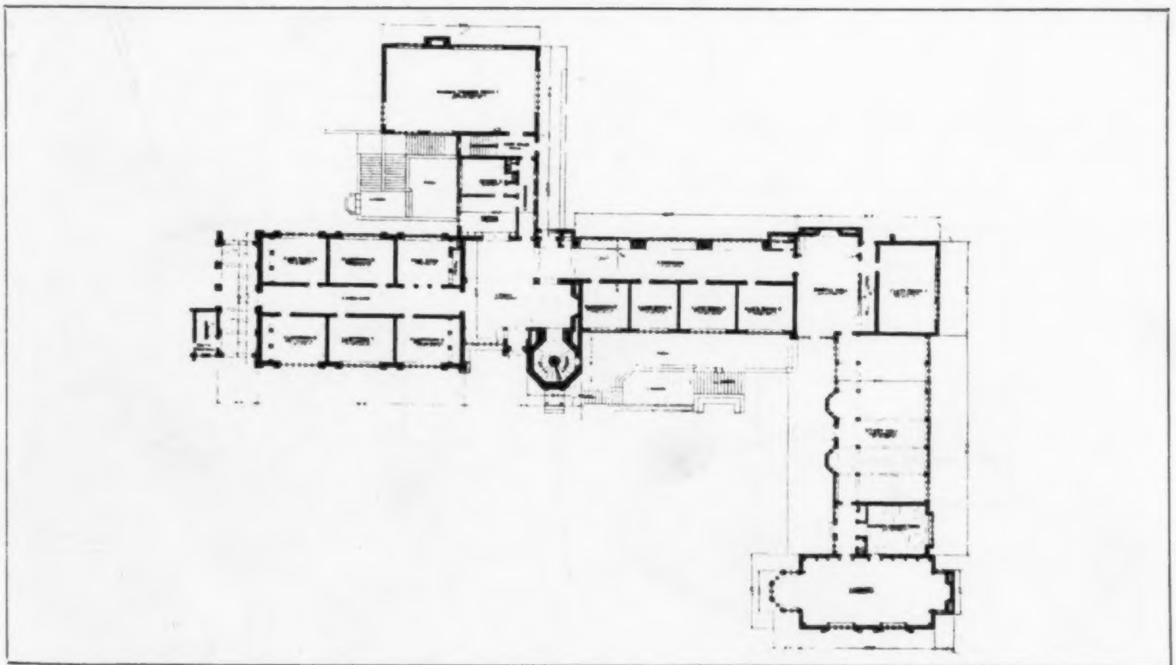
THIRD MENTION, CLASS A, AWARDED TO FREDERICK S. STOTT, ARCHITECT, OMAHA
OAKDALE SCHOOL, DOUGLAS COUNTY, NEB.





THIRD MENTION, CLASS B, AWARDED TO ELIEL SAARINEN, ARCHITECT, BLOOMFIELD HEIGHTS, MICH.

CRANBROOK SCHOOL, BLOOMFIELD HILLS, MICH.



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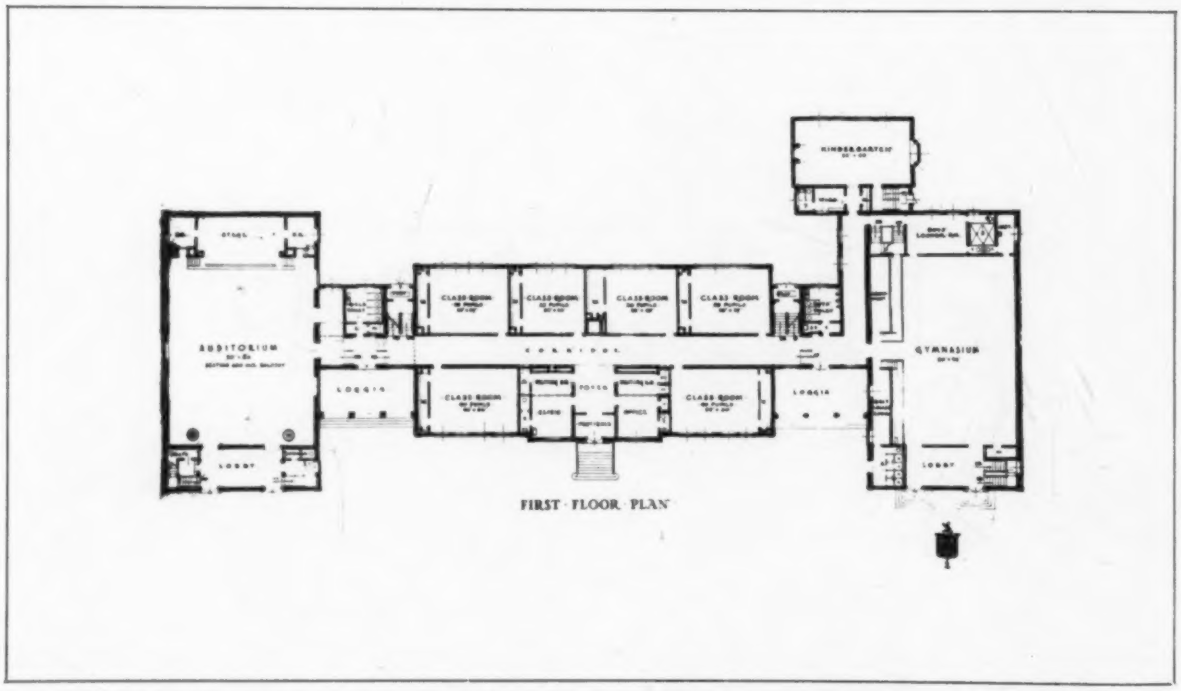
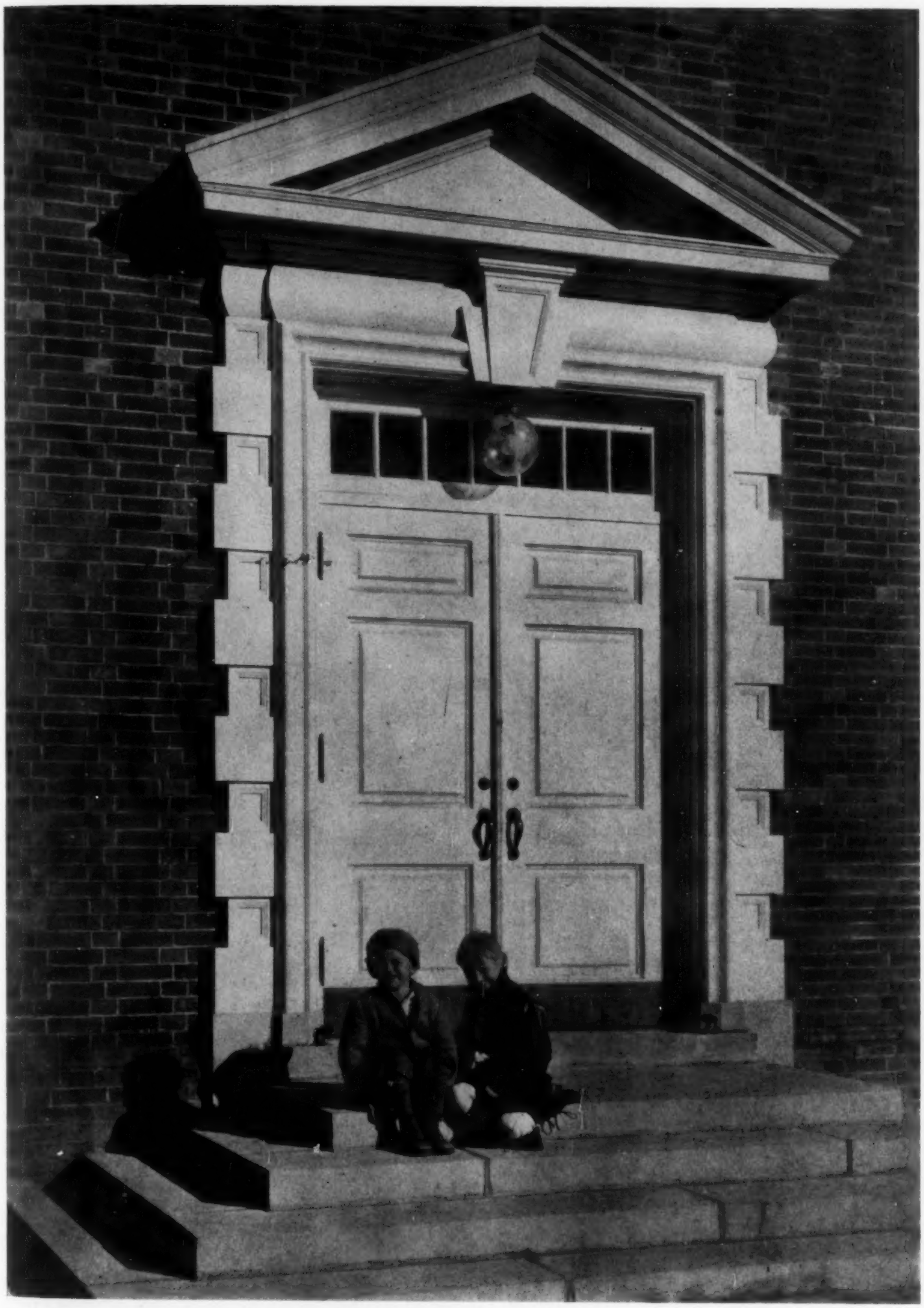


FOURTH MENTION, CLASS A, AWARDED TO COFFIN & COFFIN, ARCHITECTS, NEW YORK
GLENWOOD LANDING SCHOOL, GLENWOOD LANDING, N. Y.



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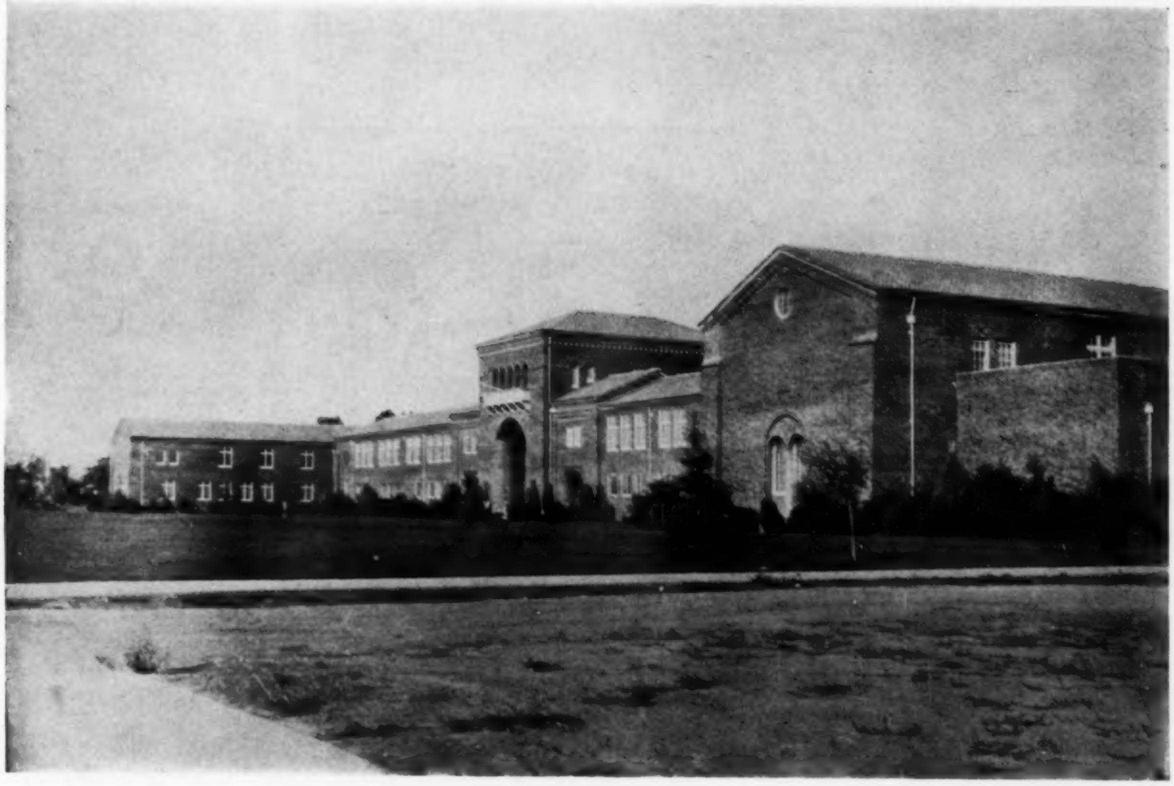
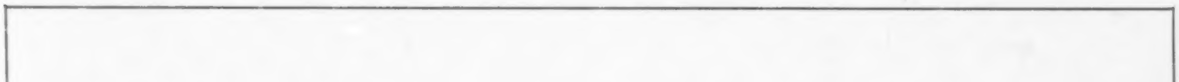
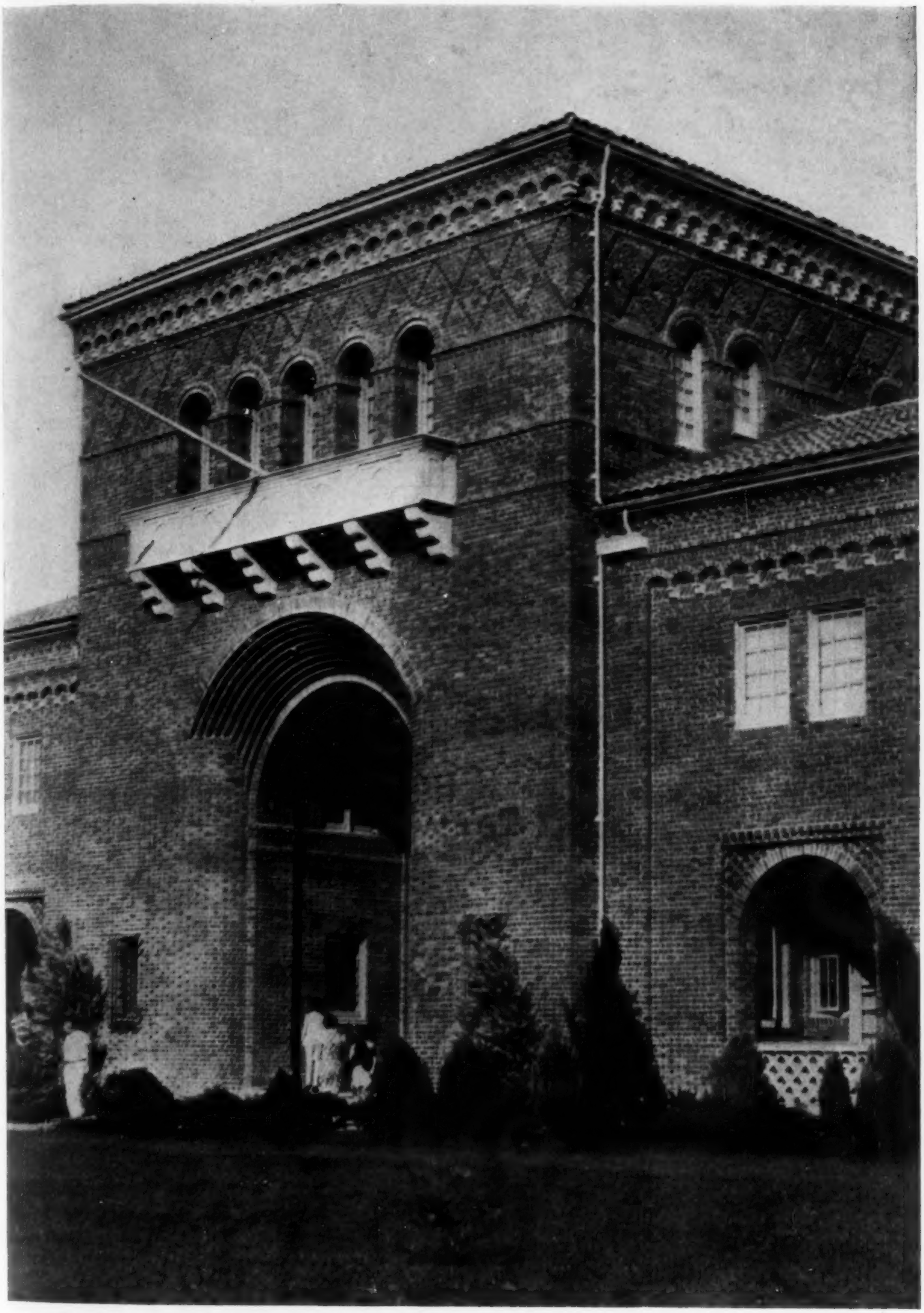
GLENWOOD LANDING SCHOOL, GLENWOOD LANDING, N. Y.





FOURTH MENTION, CLASS B, AWARDED TO DEAN & DEAN, ARCHITECTS, SACRAMENTO
SACRAMENTO JUNIOR COLLEGE, SACRAMENTO



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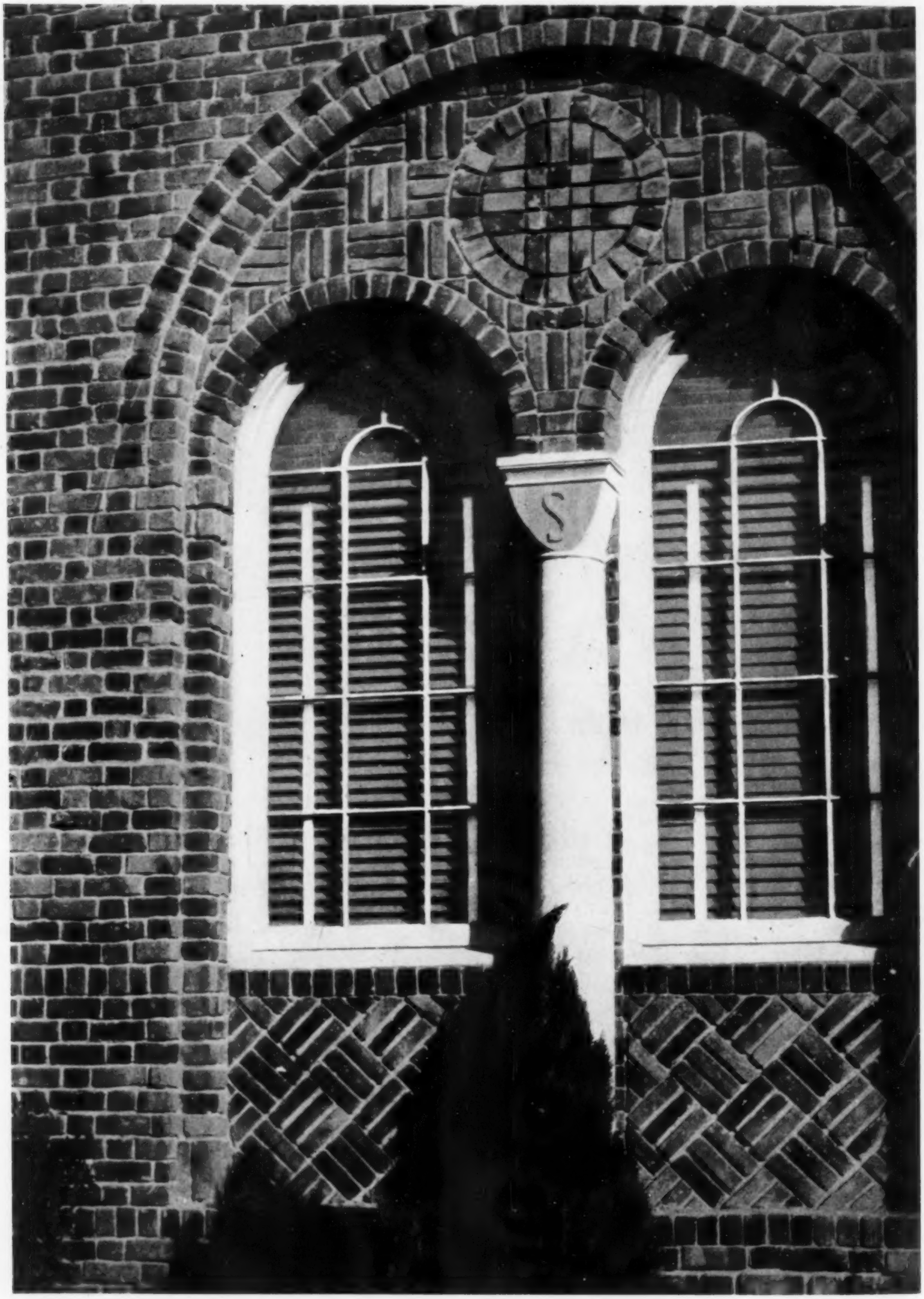

FOURTH MENTION, CLASS B, AWARDED TO DEAN & DEAN, ARCHITECTS, SACRAMENTO
SACRAMENTO JUNIOR COLLEGE, SACRAMENTO, CAL.

THE MUSEUM AND THE ARCHITECT

BY

SHEPARD VOGELGESANG

NO phrase better than "The Architect and the Industrial Arts" could have been devised to advertise the current showing at the Metropolitan Museum. A useful combination is suggested, a rare opportunity created, and everyone is invited to come and say what of it. Placed for once before the public in the light of an organizer of industrial products rather than a sort of milliner, the architect has been given a function which the public imagination should be ready to grasp. The combination suggests a tangible service which should appeal directly to American business instincts. Too little emphasis has been placed heretofore on that phase of the architect's service which differentiates it from the performance of the painter or sculptor,—on the architect's utter dependence upon steel contractors, bricklayers, and fixture manufacturers to realize his conception. The quality and character of his work depend upon the quality and character of a multitude of contributing industries. In a sense, the architect is the arbiter and interpreter of public demand in these things. He is thus indirectly responsible for much that is good or bad in the building industry. By calling in seven architects to provide backgrounds for furnishings, either designed by them or selected under their supervision, the Museum has gone further than establishing a sort of leadership for the architect.

The Exhibition follows the European closely in one respect. There are few stock articles in it. One wonders whether all of the commercial articles produced in this country are so much worse than those designed specially for it,—how the Exhibition would have appeared had the architects been called not to design the exhibition but merely to assemble it. America is justly proud of her technical achievements. It would be interesting to see how much æsthetic justification exists for this pride. In designing for quantity production rather than for hand execution, a difference between American and European procedure appears. To the European, machines and technical equipment constitute an extension of "farmer tools," the powers and limitations of which must be known to the same degree that the former artisan-designer was forced to a knowledge of his simpler equipment. The American designs, and he trusts that a method of producing his work exists or will be called into being for the sake of its production. If the American is so fortunate as to hit upon a commodity which the public wants, machines, no matter how complicated, will be developed to execute his idea. In practical production his hope is often realized, but the extension of such faith to matters of mere appearance of design is over-optimistic. While encouraging a rapid technical development in this country, the arbitrary attitude of the designer toward the machine perpetrates absurdities and increases waste. No sooner is machinery developed to turn a Jacobean spindle than spindles are declared obsolete and ridiculous, and all furniture must be plain of surface and rich with veneer; machines made for turning spindles lie idle, and the manufacturer invests hopefully in appliances for new tricks in veneer. The man who knows his tools is generally not the architect or any other agency of fashion, but the manufacturer. If the architect contents himself for a time with acquainting himself with already developed techniques rather than with involving the manufacturer in further complications, the service rendered to art and economy will be more steady progress. The manufacturer and the structural engineer should bear an equal and honored relationship to the architectural profession. The best architectural and designing training would not consist of devising pomposities of embellishment and impositions on technical processes, but would be an apprenticeship in the trades allied to architecture, followed by artistic education. Such a theory is by no means new, but its practice would indeed be a novelty. The foremost central European schools already obtain students trained at least in the handicrafts.

It is perhaps a misfortune that an exhibition in a Museum demands in the public's, as well as in the architect's imagination, luxury and ostentation. Progress would be more certain,—more soundly based,—in an exhibition of actual housing solutions,—model one- or two-room apartments fitted up with the utmost convenience and comfort. The public should be able to enter such an exhibit, pull out the drawers, sit in the chairs, turn the taps. It should be invited to give written comments and criticism. It should be able to come into contact with modern design, not be expected to stand behind a rope with all the distant, inappropriate beauty of the past behind it and to express appreciation of a new beauty, the meaning of which it has not learned to understand. If modern art in this democracy is to develop, it must itself be democratic. If it is to develop not as a joke played upon machinery but as a functioning reality, it must appeal to a class which cannot afford whims, but rather to a class of people to whom *use* not *mode* is important.

IN THE INTEREST OF ARCHITECTURAL DESIGN

BY

GEORGE MALCOLM BEAL

THE growing demand for competent architectural designers puts a heavy burden on the educational world, for it is from the schools of architecture that the artists of tomorrow will come. The converging lines of force that are pressing on toward securing a more complete and unified expression in architecture will either be brought closer together or diverted by future designers. When we look to the source of supply, there is need to reflect and question. Are the design courses in general use throughout our land conducive to developing the proper thought processes that will continue to expand or will they limit thought and encourage plagiarism?

Taking in general this program to be typical of the outline of study in the majority of schools over the country, let us consider it. In order to prepare properly for the study of analytique work, the first year is usually given over to the study of the orders. This is followed by the application of the orders in analytique design, which is in the main two-dimensional composition. Then come small compositions in the three dimensions, constituting a study of separate buildings. Finally the larger compositions, which are necessarily at a smaller scale, are given. Thus, for the most part, the student is led in his study of architectural composition from details of the orders into the study of detailed areas, then to mass composition with smaller scale detail, and finally into larger compositions with the least precision of architectural ornament.

Why not teach our future designers, from the very beginning, in a logical progression? Why throw to the student, to copy in a limited time, detail which he does not comprehend and therefore with which he only goes through the mechanical process of reproduction? Training in the ability to draw what one sees is good, but what about forcing the student to think, if he gives any thought, to the details of a style he does not understand? For details are not the first thing considered by any well trained designer. Often the study of architectural history with its emphasis on the different styles, is not commenced until after the student has passed his first year of blindly copying the orders.

After very carefully forcing our students to think details for a year or two, we ask, hope and even expect them to loosen up and portray to us a spirit of space harmony, with little thought to detail, in the form of a sketch problem. Then we wonder why such poor results are turned in on these short problems, which should convey well proportioned ideas and not precision of detail. Are we not somewhat to blame for this, by confusing the mind of the young student with over-attention to ornament?

There are many problems connected with the teaching of architectural design, but these, I believe, can be corrected to a large extent if the proper thought and attention be given. All too often, the student commencing the course is unable to express himself at all in free-hand drawing and does not know how to use instruments. This, after only four years of study in which knowledge of many other subjects must be gained, puts a severe burden on the shoulders of the teaching profession, if it is to turn out men who have the fundamentals of design and the ability to express themselves thoughtfully. Very often the student, in order to gain recognition for himself and uphold the standard of the school, puts in night after night concentrating on design, neglecting other subjects and narrowing his life outlook. The ability to see life through a broad and noble vision is no small aid to the designer, and it should not be left uncultivated. Lengthening the period of architectural study to five years is a help, but does not solve the problem.

In referring to ornament, Claude Bragdon says: "At present this need is met by universal and unashamed copying of the past; the library and the museum are the places from which all the little pitchers are filled with these stale waters instead of from the creative imagination whence wells up the Water of Life." Do we not need a revision of our design courses so that the student's mind may be cleared of too early an attention to detail before a spirit of feeling for mass and area has been acquired? Larger problems, with little attention to detail, which embody the principles of composition in mass, area and to some extent line, might well be given first. Isometric drawing might be used to advantage in arranging proportion in volume and mass until an understanding of perspective could be gained. By working from the large compositions, especially in plan, to smaller problems of separate buildings without details,—perhaps expressing the building in plan and mass only, with the fenestration merely openings through the wall,—then moving on to two-dimensional detail studies in elevation, the mind of the student would not be confused. It would be aided in thinking of space relations and would gain a feeling for proportion which would then be carried into the details. This would also allow time for a more thorough understanding of the development of styles and for gaining knowledge of ornament.

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Contributing Editors:

Harvey Wiley Corbett; Aymar Embury II; Charles G. Loring; Rexford Newcomb; C. Stanley Taylor; Alexander B. Trowbridge

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THE
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APRIL 1929

AIRPORTS,—THE NEW ARCHITECTURAL OPPORTUNITY

BY

TYLER STEWART ROGERS

SO rapid has been the development of civic and commercial aëronautics that it has already reached the point where its further growth is largely dependent upon the provision of adequate ground facilities in the form of landing fields, airports, and the many types of accommodations that must be provided for the care of airplanes, pilots, passengers, and cargo. It is only within the last year or so that American cities have awakened to the fact that they must provide airports immediately if they are to benefit by the stimulation which aviation can give to commerce, industry and transportation.

In a bulletin issued in the fall of 1928,—less than six months ago,—the United States Department of Commerce listed fewer than 400 airports either completed or actually under development, exclusive of those used for military and naval forces. During an address presented before airport interests at the aviation show in New York in February, Colonel Harry H. Blee, Chief of the Airways and Airports Section of the Department of Commerce, said that there were approximately 1,000 airports then actually in use or under construction, and that about 1,000 others were being studied by chambers of commerce, municipalities and other interests with a view to selecting sites, arranging finances and otherwise preparing for active work. He qualified the statement by saying that even these figures were not reliable because they were changing daily. Estimates of the amount of money being expended in this new field are likewise vague for this same reason. Figures covering the last year and a half showed the enormous amount of $300,000,000 already spent or pledged for airport development, and a forecast was made that at least $500,000,000 would be spent in the next year and a half for such work. If these figures are out of date today, they are merely conservative, and undoubtedly a few years hence will be insignificant compared to the amount of money being expended annually for ground facilities to serve air transportation systems and the use of private aëroplanes for recreation and commuting.

Here is a vast new field of activity that involves very important problems in architecture, engineering and city planning. What have architects done to take their logical place in this new work? A recent bulletin published by the Department of Commerce lists 28 organizations or individuals rated as airport designers and constructors. Of these 28 not over four or five are architects or engineers serving in a purely professional capacity on design problems. The others are former aviators who have entered this new field or construction organizations that have seized the opportunity to capture desirable contracts of this character, and in a few instances companies that have been formed to advise professionally on airport designs, calling themselves "airport engineers." No implication is intended in this statement that the 23 or 24 organizations, exclusive of established architects and engineers, are not qualified for the work they are engaged upon; it is merely significant that so few well trained and well established architects and engineers or city planners have yet achieved recognition in this field.

Architects, engineers and city planners can and must solve America's airport problems. They are already trained for this work. They alone have the background needed to handle such operations in a constructive and farsighted manner, and they lack only an appreciation of some basic aëronautical requirements. Even these requirements are rapidly becoming public property through the dissemination of information by the Airways and Airports Section of the Department of Commerce, the National Aëronautical Association, the National Advisory Committee for

Entrance to Passenger Station, Tempelhof Field, Berlin

Modernistic Restaurant in Tempelhof Field Airport, Berlin

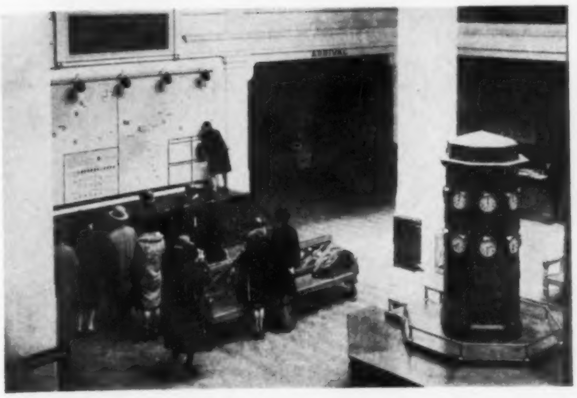
Aëronautics, and other organizations of like character.

There is a close parallel between the present-day development of airports and the early expansion of railway transportation systems and terminals in this country. The passenger stations and terminals that were built a half-century ago were badly designed structures, not adapted to serve the enormous expansion in railroad traffic that subsequently followed. They were designed poorly (from the present-day point of view) largely because there was little precedent for planning such structures and because few people could visualize the requirements that were subsequently imposed upon them. Within recent years hundreds of millions of dollars have been spent to revamp, reconstruct and often re-locate not only important terminals but literally thousands of minor railway stations to adapt them to modern needs.

The modern airport, like the railway station, will become a gateway to the city which it serves. It must possess dignity and quality in keeping with its important civic character. There is already a very noticeable tendency for some airport developers to create structures of more or less temporary character which will rapidly become obsolete and inadequate to meet the requirements of air traffic. In fact many of America's existing airports are comparable to a railroad terminal consisting of a round house, track yards and a freight shed which also houses the ticket office and waiting room. Out of the hundreds of millions of dollars to be expended for airport development in the immediate future, a very substantial proportion will be wasted through obsolescence if the problem is not immediately attacked in a broad way and if an effort is not made to visualize future requirements and to provide for them in the initial layout and construction of airport facilities. This has already occurred at Croydon, England, where structures which cost some $600,000 have been scrapped and replaced by modern buildings costing over a million dollars. Even the famous Tempelhof airport at Berlin, undoubtedly the finest airport in the world today, has been undergoing constant evolution for the past several years to meet the rapidly expanding air traffic of which it is the center. Comparatively few American airports have yet been carefully planned to provide for expansion at the rate already experienced by the leading European airports. Most of them have started with merely landing fields, and their structures have grown haphazardly. There is not even general consensus of opinion as to the proper method of developing American airports, and in some cases municipalities have leased parts of the landing areas they control to air transportation systems which have erected their own structures without any regard to the others or to the general utility of the field.

Such conditions are regrettable but perhaps inevitable at this stage. It is a fact that the development of commercial aëronautics has been so rapid that the ground problems which have been created have multiplied far more rapidly than they have been solved. It is essential that airport design be considered with the intelligence and foresight that has been applied to aërodynamics and the design of flying machines. Architects, engineers and city planners, trained to solve planning problems of this magnitude, must turn their attention to airports, not only for the sake of commercial and civic aëronautics but because here is a new field of business which they should logically develop.

Undoubtedly the very recent announcement of the Lehigh Airports Competition among architects and engineers for the design of a modern airport is the most significant move that has been made to bring architects, engineers, and city planners into public notice as the logical persons to guide the future development of America's airports. This competition is sponsored by the Lehigh Portland Cement Company of Allentown,



The Waiting Room in the Croydon Airport, Showing Time Indicators and Weather Map

Entrance to Airport Administrative Buildings, Croydon, England. Control Tower on Left

Pa., which has posted $10,000 in prize money to be awarded those supplying the 14 best designs which are submitted. The competition has been planned with the utmost care and under the guidance of some 25 recognized authorities in the four fields of architecture, engineering, city planning, and aëronautics. The preliminary work which had to be accomplished in order to formulate a sound competition program is in itself of considerable interest to architects, because it was necessary to touch upon every phase of airport layout and facilities and to attempt to visualize the hitherto undeveloped possibilities for the arrangement of airport units, in order to give the competitors free rein to work out new and ingenious solutions of the problem without being hampered by the often unsatisfactory precedents which the world's existing airports now constitute. Some of these matters will be touched upon later. The competition is exceedingly timely and should prove of the utmost value to the architectural and engineering professions and to city planners, as well as to the entire aëronautics industry.

A number of people prominent in public life, including William P. Mac Cracken, Jr., Assistant Secretary of Commerce for Aëronautics; F. Trubee Davison, Assistant Secretary of War; Senator Hiram Bingham; former Postmaster General, Harry S. New; Dr. Samuel S. Stratton, President of the Massachusetts Institute of Technology; and others, have indicated their interest in this competition because of its potential value in stimulating sound airport development. In commenting on the work of the committee, Mr. Mac Cracken said:

"'Build the bird house and the birds will come' is an old saying, but it is more true of human beings than it is of our feathered friends.

"The character and attractiveness of America's airports have a direct relation to the people's interest in the growth of air traffic, public and private. The degree to which any community can participate therein is directly in proportion to the provision which that community makes for getting airplanes in and out of the air. In other words, it means bigger and better airports and more of them. Any municipality which overlooks today's great opportunity for providing for air traffic of not only the future but of the present, will be found in the same position as those which refused to accept the railroad in pioneer days.

"The airport architecture which is being developed by the Lehigh Airports Competition will be of particular help to American municipalities in solving their airport problems. It should, therefore, command the good will of all forward-looking people."

The company in sponsoring this competition has entirely removed any possibility of there being a commercial aspect by giving the program committee and the competition management carte blanche authority to establish the requirements of the competition in whatever manner will be of the greatest value to the competitors and to municipalities, air transport companies, flying clubs, chambers of commerce, and others interested in the creation of future airports. It is a far-sighted gesture for the benefit of many interests, from which the sponsors expect no return other than added good will and prestige. Roland D. Doane, representing the company, has merely asked that the competition drawings indicate the structures as though built of Portland cement products where feasible, admitting reinforced concrete construction, concrete blocks, or stucco over other sound and permanent structural materials.

When this competition was first proposed it immediately became apparent that the program could be prepared only after a great deal of study of the character and the facilities demanded in

General View of Croydon Airport, Showing New Administrative Buildings, Control Tower and Several Hangars

a complete, well appointed airport. It was then decided to obtain the advice and counsel of leading architects, engineers, city planners, and aëronautics experts through the medium of a program committee to which would be entrusted the preparation of the competition program and subsequent oversight of the entire contest. Harvey Wiley Corbett, is general chairman of the program committee, and Francis Keally is the professional adviser. The architectural section of the committee includes Mr. Corbett as chairman, Raymond M. Hood, Professor William A. Boring, Dean of the School of Architecture, Columbia University; Parker Morse Hooper, Editor of The Architectural Forum, and Mr. Keally. Engineering matters bearing upon airport design were considered by an engineering section headed by Morris Knowles, of Pittsburgh. Other members of this section are Francis Lee Stuart, one of America's outstanding engineers specializing in port, terminal, and transportation work; Harold M. Lewis, Executive Engineer of the Regional Plan of New York and its environs; Gavin Hadden, and Colonel Willard Chevalier, Publishing Director of *Engineering News-Record*.

Airport planning is so definitely a part of city and regional planning in the relationship of airports to other transportation methods and to the communities they serve, that it was quite essential to have guidance on these problems. At the same time it was recognized that municipal, state, and county authorities are keenly interested in airport design and location. In consequence, a third section of the program committee was organized, headed by George B. Ford, city planner, as chairman. The membership of this group includes E. P. Goodrich, city planning consultant to the Chinese government, who is now in China planning airports as a means of expanding aërial transportation systems in that country in lieu of the slower and more expensive extension of the national railway system; Fred C. McLaughlin, Mayor of White Plains, N. Y., and President of the New York State Conference of Mayors and of the Westchester County Federation of Planning Boards; Samuel P. Wetherill, Jr., President of the Regional Planning Federation of the Philadelphia Tri-State District; and Harold Buttenheim, Editor of *American City*.

Necessarily, the most vital matter in the formulation of a competition program as well as in the actual designing of any airport is the need for solving practical aëronautical problems. The aëronautics section, headed by Dr. George W. Lewis, Director of the National Advisory Committee for Aëronautics, as chairman, was thus organized to secure the counsel of men representing every leading aëronautical organization as well as the practical management of commercial and municipal air terminals. The membership of this committee includes Porter Adams, Chairman of the Executive Committee, National Aëronautic Association; Major John Berry, Manager of Cleveland Municipal Airport; Colonel Harry H. Blee, Chief, Airways and Airports Section, Department of Commerce; L. K. Bell, Secretary of Aëronautical Chamber of Commerce; Colonel Paul Henderson, Vice-president, Transcontinental Air Transport, Inc.; Charles S. (Casey) Jones, President Curtiss Flying Service; Ernest Jones, Aëronautics Expert, Department of Commerce; and Harry Schwarzschild, Editor of *Airports*. The problems considered by these four sections of the competition program committee are the problems which face any architect, engineer, or city planner undertaking the design of a well equipped air terminal, and a brief discussion of the more vital matters may prove of interest.

Site Requirements for Airports

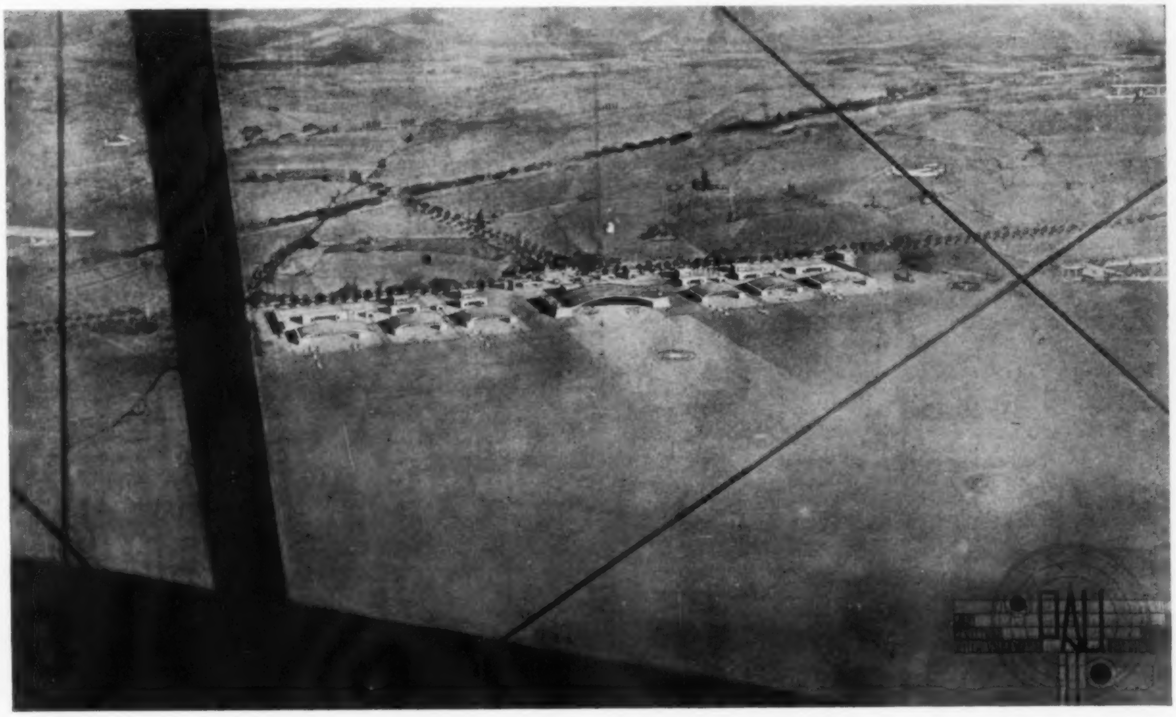
There is a universal feeling that airplanes will be so developed in the future that they can land

Hangars at the Ford Airport, Dearborn, Mich.

and take off in less space than is now required. Undoubtedly, this is true, and the progress already made, including the development of the autogyro abroad, will probably make it possible in the future to utilize less landing area than is now necessary. On the other hand, it must be remembered that there will be an equivalent expansion in the use of planes, not only for commercial transportation, but by private owners for recreation and commuting, and as this growth takes place, more planes will arrive and take off simultaneously, requiring correspondingly larger areas for maneuvering. Furthermore, it has already been demonstrated that the establishment of an airport stimulates realty values in the locality and leads to development of vacant land nearby with industrial plants associated with the aëronautical industry, with homes, and with all of the structures which naturally congregate around any center of transportation, such as hotels, stores, and amusement places. Thus, when the boundary of an airport site is once established, it is exceedingly difficult to expand the site by acquisition of adjacent vacant land, because in a few years increased values make such land out of reach for airport use, or what vacant land there was when the airport was established becomes developed with more or less costly structures which cannot be removed. Consequently, it is important to take as much land as possible when an airport is first established and to maintain control of the entire area in order to provide for future needs as well as to give an adequate, effective landing area for present-day airplanes.

It is not necessary to discuss in detail the permissible minimum sizes for flying fields. The United States Department of Commerce, through its Airways and Airports Section, publishes bulletins which are available to architects, engineers, and others interested, in which these dimensional requirements are discussed and a rating system is established. Colonel Harry H. Blee, chief of this section of the department and a member of the Lehigh Airports Competition Program Committee, in considering this matter felt it advisable to recommend an effective landing area of 3,500 feet in all directions, but at the same time he said that this is in excess of the space required for the highest airport rating. In other words, while 2,500 feet in each direction or even shorter runways, will suffice for minor airports and emergency landing fields, it is good judgment to take the largest area available up to approximately a square mile.

The gross area consists of three major space units, the first of which is the landing and take-off area which is wholly free from obstructions of any kind, and it is this part of the field which should be as large as circumstances will permit. Modern airplanes have a safe gliding angle of 7 to 1 and can gain altitude in approximately the same ratio. Hence, the effective landing area must be protected by the second space unit, which may be termed a marginal strip. The marginal strips must have a width which is seven times the height of any building or other elevated obstacle bordering on the landing field. It is perfectly feasible to utilize these marginal strips in various ways, providing the structures erected upon them do not project above a line having a 7 to 1 starting at the edge of the effective landing area. Such space may be used for parking automobiles and for mooring planes which do not require hangar protection, as well as for playgrounds, outdoor restaurants, parks, and various other types of concessions and amusements. In fact, the marginal area may be developed to produce an important revenue to the airport, for all of the European airports experience a steady flow of visitors who come to watch the flying activities. Over weekends from 10,000 to 12,000 persons regularly visit the Tempelhof field in Berlin to patronize the beer garden, the promenades, and the amusements while they watch transport



Perspective by Maurice Chauchon, French Architect, for a New International Airdrome at Pau, France

planes arrive and depart. The third section of the site is that part reserved for the important airport structures which will be mentioned later and which must be separated from the effective landing area by the same type of marginal strip which protects the other borders of the field. This vacant space, however, between the airport buildings and the landing field, is usually reserved for the maneuvering of planes, and is not available for public use.

The ideal airport must permit airplanes to land and take off into the wind at all times. Theoretically, the field should provide runways or lanes in all directions, even though the prevailing wind in any given locality may be predominantly from one quarter. Experienced flyers find no difficulty in landing into a quartering wind, but it is exceedingly difficult to land a plane crosswise with the wind. It is practicable, therefore, to have runways or landing strips in eight directions, equivalent to the four cardinal and four quarter points of the compass.

The problem of developing the field surface for landing and take off is one of the most difficult and expensive matters that is encountered in creating an all-purpose airport. Perfect drainage is essential at all times, and particularly for spring conditions, when the ground is thawing. When funds permit, it is of course vastly better to have the entire landing area surfaced or paved uniformly, but today the expense of such preparation is quite prohibitive. For some years to come, therefore, it will be necessary to provide landing strips or runways especially prepared for the landing and take off of planes, but these must be absolutely flush with the adjacent unpaved areas and as level as possible. The arrangement of these runways should be such as to allow the maximum number of planes to depart and arrive simultaneously without danger of interference or collision. It is also important that the runways as well as the entire field be surfaced with a material which will make artificial lighting for night flying effective at minimum cost.

Airport Structures

The modern airport must be conceived as a transportation terminal and must be equipped to handle passengers, mail, express, and even freight. It must also provide for private planes which do not operate on schedule, and for sightseeing planes which use the port as a base of operations. The required structures to serve these functions may be divided into three basic groups, exclusive of the accessory buildings which are desirable but not essential to the airport proper. These three groups include the terminal facilities, caring for passengers and cargo; hangars for the care of planes; and service units for housing maintenance equipment, supplies, and possibly also the personnel of the field.

At Miami there is probably the most completely

Airplane View of the Ford Airport, Dearborn, Mich., Showing Buildings and Field

appointed terminal building yet erected in the United States. It was designed by Delano & Aldrich, architects. It contains a passenger concourse or waiting room with the usual ticket offices, check room, public toilet facilities, newsstands, and other concessions associated with the ordinary railroad passenger station. The main floor is so arranged as to control passengers arriving by plane from Cuba, for inspection by immigration, customs, and health authorities. This feature suggests that every airport in the United States may ultimately become a possible port of entry, for flights have already been made from Mexico to northern points in the United States, and from Canada to southern and western points. This building also provides offices for the air transport officials, and on the second floor, overlooking the flying field, there is a large dining room adjacent to an open air terrace which is a wonderful vantage point from which to observe the arrival and departure and the maneuvering of airplanes.

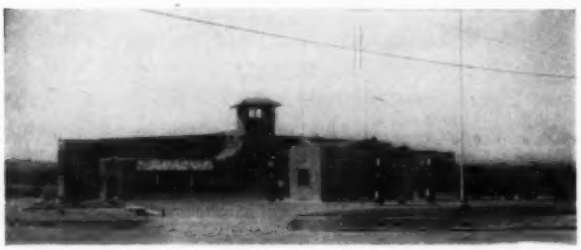
This building, more completely than any other, suggests the character of the ideal terminal structure for an airport. An important feature of such a building, unless provided for in a separate unit, is a control room, commanding an unobstructed view over the entire airport from which an operations executive can exercise complete control over all activities on the field. This control room is usually elevated above surrounding buildings, generally in the form of a low tower above the roof line of the highest structure, and it adjoins a radio and communications room equipped to maintain contact with other airports in all directions and by radio with planes in the air. These units constitute the nerve center of the airport and are vital to its operation because it is necessary to prevent planes from landing, especially at night or in fog, when others are about to depart, and to notify planes en route of other machines flying in their general directions to minimize the possibility of collision in mid-air and to aid them in keeping to their courses. Undoubtedly also the modern air terminal must provide post office facilities and a sub-station, although at present the Post Office Department does not consider these elements essential because the present custom is to remove air mail by motor trucks direct from the planes to existing post offices.

Another requirement of the well designed terminal building is provision for the safety and protection of passengers using private or transport aëroplanes. There should be some type of covered runway leading from the waiting room to the loading point for planes which is so devised as to prevent the passengers from getting in the way of whirling propeller blades. At a separate point there should be similar provision for protecting arriving passengers from inclement weather and for keeping them under control until

Malmo, Sweden's Spacious Airport, Showing Interesting Housing Development Near the Field

they have passed the immigration and customs authorities if the plane happens to have come from a foreign port. Separation of these two loading and unloading points is desirable. It is also essential to have the entire flying field protected by a suitable wall or fence which will keep unauthorized persons and often stray animals from the field and permit the control of even those using private planes in their entrance and egress from the flying area.

The second group of structures,—the hangars,—needs little discussion, because the functions of hangars are well understood. They require unobstructed floor space, good lighting, and should be fireproof, weatherproof and easily heated. In some European airports hangars are made two stories in height, using a ramp to reach the upper floor, and it is possible that the reverse will be true of some future airports having part of the storage space below ground. The most difficult problem in hangar design is to provide the vast doorways necessary for the admission of large planes. After much study the Lehigh Airports Competition Program Committee suggested some openings 125 feet wide by 20 feet in clear height, and others for smaller planes 90 feet and 100 feet



Building at the Dennison Airport, Atlantic, Mass.

in width and 18 feet and 19 feet respectively in clear height. These requirements may change as transport planes become larger, but for the present they will house the typical units now contemplated or in use.

The third group of buildings includes fire and ambulance stations with quarters for emergency crews and garages and storage buildings for trucks, tractors, snowplows, rollers, grass cutters and other equipment needed for the care and maintenance of the fields. A gasolene and oil filling station is an important requirement to this group. Frequently the tanks are buried underground and supply lines are run to pumps near the hangars or to underground receptacles located in concrete aprons on the fields themselves. These sub-surface filling points are covered by manholes which can be lifted and the fill pipes withdrawn so that when the covers are replaced planes can run over the surfaces without difficulty. There must also be provision for housing the field personnel, but this may be provided for outside of the airports proper or in parts of hotels which are mentioned under the heading of "accessory structures."

The arrangement and grouping of these various units constitute a problem that has not yet been solved with a certainty that the ultimate plan has been discovered. In some airports the hangars are separate units, and in others they are grouped together as elements of a large structure. In some places they are adjacent to the passenger terminals, and elsewhere they may be separate from these units for considerable distances. It is essential to provide a well paved and practically dustproof apron connecting the hangars and the loading

Construction in Progress, New Croydon Airport with System of Concrete Aprons and Maneuvering Space

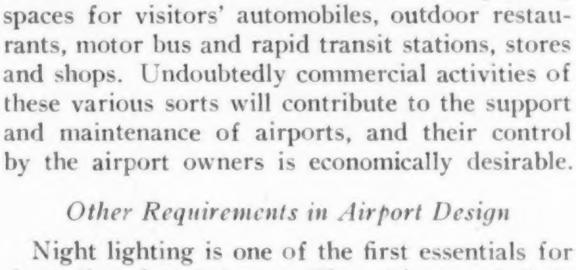
point at the passenger terminal for maneuvering planes either under their own power or by means of tractors and for warming up motors where the wind stream from the propellers will not throw up a cloud of dust. If the flying field is of adequate size and the buildings can be separated from the field by a sufficient marginal strip as already noted, their precise relationship to the flying area seems to be of secondary importance, and their location is largely governed by the highways and other means of communication between the port and the city which it serves. If the field is of limited area and the runways are of minimum length, it should be considered essential that no buildings be located opposite the end of any runway, and particularly that they should not be in the direction of the prevailing winds.

Accessory Structures

Under this head fall a number of possible units which have already found their place in well established European airports but which may not be absolutely essential to port operation. First of these is a hotel. At Croydon, England, a 200-room hotel has been erected near the airport buildings and has proved successful. It has been found that many visitors to the field use its extensive restaurant facilities, which overlook the flying area, and that passengers frequently use it as headquarters from which they make visits to the surrounding country during interruptions to their air travel. Such a building may also provide accommodations for pilots and the ground personnel of the field as well as provide apartments for the important officials and executives of the field and the air lines which converge there. Under this heading also fall all types of concessions and amusements as well as parking spaces for visitors' automobiles, outdoor restaurants, motor bus and rapid transit stations, stores and shops. Undoubtedly commercial activities of these various sorts will contribute to the support and maintenance of airports, and their control by the airport owners is economically desirable.

Other Requirements in Airport Design

Night lighting is one of the first essentials for the well equipped airport. The subject needs little discussion here, however, because the problem does not influence the architectural development of an airport to any great extent, and because the subject is quite fully covered in publications issued by the Department of Commerce and other authorities. Adequate lighting involves border lights to indicate the margins of the field; air beacons; an illuminated wind direction indicator; danger lights on all surrounding obstructions; and flood lights to illuminate the field for landing and take off. Every airport must be identified by huge signs visible from the air and preferably illuminated at night. These may be on the roofs of units or other buildings on the field itself or



Buildings of the Oberweisenfield Airport, Berlin

Control Tower, Croydon Airport, with Signal Cabin and Wireless Equipment

Airport Beacon of 30 Million Candlepower, at Oakland, Cal.

even on adjacent buildings in the vicinity, with arrows pointing to the airport itself. Here again the Department of Commerce has established recommendations and requirements which are easily followed. The wind direction indicator referred to, sometimes called the "wind-tee," is something like a mammoth weather vane with its flat surface *horizontal* so as to be visible from the air and to constantly point the direction of the prevailing wind.

One of the major problems in airport design involves locating the field with relation to adjacent highways and transportation facilities. The amount of traffic ultimately to be expected at airports suggests the desirability of having a broad plaza, such as may be found adjacent to the better planned railway terminals, which will care for the traffic converging at the passenger terminal and give this structure a proper and dignified setting.

EDITOR'S NOTE. We are indebted to Mr. Harry Schwarzschild, Editor of *Airports*, for giving us permission to publish here many photographs from his personal files.

Airport Passenger Terminal of the Pan-American Airways, at Miami
Delano & Aldrich, Architects

CHOOSING THE STRUCTURAL SYSTEM AND MATERIAL

BY

THEODORE CRANE

ASSOCIATE PROFESSOR OF BUILDING CONSTRUCTION, YALE UNIVERSITY

PART I—BUILDING FRAMES

IN looking over the vast quantity of printed matter dealing with the subject of building materials, one can hardly fail to be impressed by the amount of study and research which has been expended in this field. If an architect is considering the use of a particular type of construction, there are usually technologic papers, textbook references or society reports bearing upon its value. Very little attention, however, has been given to that aspect of the subject which might be called "comparative construction," that is, the *relative* value of materials and systems.

To make the matter clear, let us consider a very simple illustration,—the choice of a floor system. Every textbook on reinforced concrete describes the so-called "beam and slab" and "girderless" designs. An architect's office is flooded with manufacturers' literature illustrating any number of proprietary methods of construction. The architect's problem, however, is not the detailed study of a particular system, but the selection of the most suitable type for the conditions existing. With this in mind, these articles have been written to point out the individual characteristics of various materials and systems, as affecting their use, and to suggest methods of arriving at a satisfactory choice in structural work.

The first question of this nature, and a question which can usually be very easily answered, is regarding choice between bearing walls and skeleton construction.

In most cases the problem is purely economic, and the thickness of bearing walls, where such are employed, is governed by the requirements for stability rather than by the strength of the materials in compression. Under the New York building code, which represents in this particular those of our larger cities, brick masonry laid in Portland cement mortar is allowed to take a working load of 250 pounds per square inch, Portland cement concrete 500 pounds, and sandstone masonry 400 pounds. These stresses are seldom critical in bearing walls. The limit of economy is determined rather by the wall thicknesses required for various heights and unsupported areas. For instance, a building of the residence class, under 75 feet in height, would require, by this same code, 12-inch walls for the "uppermost 55 feet, and 16-inch below that." For public or business buildings between 60 and 75 feet in height the bearing walls would have to be 16 inches thick for the "uppermost 50 feet, and 20 inches below that." In both cases additional thicknesses are required for walls built of rubble masonry. Furthermore, when the clear span between bearing walls is over 26 feet, or the length of the wall without lateral support is over 105 feet, or more than 30 per cent (45 per cent when wall area is laid in Portland cement mortar) of the horizontal wall area is occupied by openings, the thickness must be increased. Wall thickness for wall-bearing buildings over 75 feet in height increases very rapidly. For example, in the class of public and business buildings a structure 80 feet high would require, under the New York code, 16-inch walls for the uppermost 25 feet, 20-inch walls for the next lower 35 feet, and 24-inch walls below.

Compared to these requirements, a 12-inch panel wall, supported at each floor level by a structural steel or reinforced concrete spandrel, is usually more economical, all things considered, for fire-resistant construction over three or four stories in height, and for garages or industrial buildings of even lesser height. The use of structural steel frames for one-story buildings is often desirable to meet the requirements of certain industries, and although still in an experimental stage, the application of steel sections to the construction of dwellings has interesting possibilities for classes of work where economy is a chief consideration. These uses of steel are, however, the exception, and its particular function is in the frames of comparatively tall buildings.

For this type of work the practice of a few years ago of employing columns built up of plates and angles has largely given place to the use of solid rolled sections, normally two stories in height and designed to carry the load of the lower story. A comparatively recent development is the use of column sections, five to six stories in height, for the support of reinforced concrete floors. Finding that two-story lengths were impracticable and desiring to use a heavy H-section through the lower stories in order to save floor space, these long columns fitted with angles at each floor level have been successfully used for buildings of 10 to 20 stories, to support stone-concrete floors of girderless design. This type of column construction, as built in New York, usually calls for a reinforced concrete section through the upper stories of the building, which is carried down until the size becomes objectionable. For

Photo. Tebbs & Knell, Inc.

Uppercu-Cadillac Building, New York. Reinforced Concrete Frame with Interior Steel-cored Columns

Framing of the Uppercu-Cadillac Building. The Floor Construction is of the Girderless Type
Charles E. Birge, Architect

example, let us consider that the upper eight floors and roof of a 14-story building are supported by reinforced concrete columns. Under the New York code these would probably be of hooped section in the two upper stories and of spiraled design below. Even the latter, however, would require a gross diameter of about 2 feet, 6 inches, when carrying large bays subjected to light manufacturing loads. If this were considered to be a limiting size, the fifth story columns would then be designed with rolled steel cores of H-form, the sections being based on the loads which the fifth story columns are required to support and plates added to take the increments due to the floors below. The gross column size, 2 feet, 6 inches, would then be the same in all of the remaining lower stories.

Such a combination of structural steel and reinforced concrete makes it possible to utilize the advantages of each material, now that the mechanical difficulty of field erection has been solved by obtaining long sections from 60 to 75 feet in length. With this one important exception, however, the structural steel frame, or the reinforced concrete frame offers two distinct alternatives in the field of skeleton construction. For buildings of certain classes the choice is obvious; factories and warehouses with heavy floor loads ranging from 125 to 300 pounds per square foot and of comparatively low height can generally be built more cheaply of reinforced concrete than of structural steel. Office buildings, hotels and apartments, 15 stories or more in height, can usually be built more cheaply with steel frames. But we must not place too much confidence in such broad generalizations. The tallest concrete building in the United States is the recently completed Master Printers' Building in New York, which has 20 stories. In this case the use of concrete showed a very substantial saving over steel. Let us investigate the conditions. A live load of 250 pounds per square foot was required on all floors; the plan of the building was adaptable to a girderless floor system, which is extremely economical for heavy industrial loads. As the conditions of occupancy demanded that headroom be computed to the bottoms of girders in a beam and slab design, their elimination permitted several additional stories in the same total height of building. Furthermore, the lighting was better with girderless construction, and the cost of sprinkler installation was about 25 per cent less.

The same solution has been worked out economically in the case of several other structures erected in New York during the last year. For example, there are the Appraisers' Stores Building, 11 stories high, with 250-pound live load; a service station for the Packard Motor Company, eight stories high, with 150-pound live load; and the building at 653-659 Eleventh Avenue, 14 stories high, with 200-pound live load. These were all concrete-framed buildings employing structural steel cores in the lower stories of the interior columns and with girderless floor systems of spans varying from 20 feet x 20 feet to 31 feet, 6 inches x 33 feet. If we are to assume, as would seem reasonable, that these operations represent an actual trend in design, it is probably safe to say that reinforced concrete frames, particularly where a girderless floor system can be used, are well adapted to comparatively heavy loads for buildings even up to 20 stories in height.

Framework U. S. Appraisers' Stores, Combined Long Column-cores with Girderless Floor System

Photo. Tebbs & Knell, Inc.

U. S. Appraisers' Stores Building, New York
Buchman & Kahn, Architects

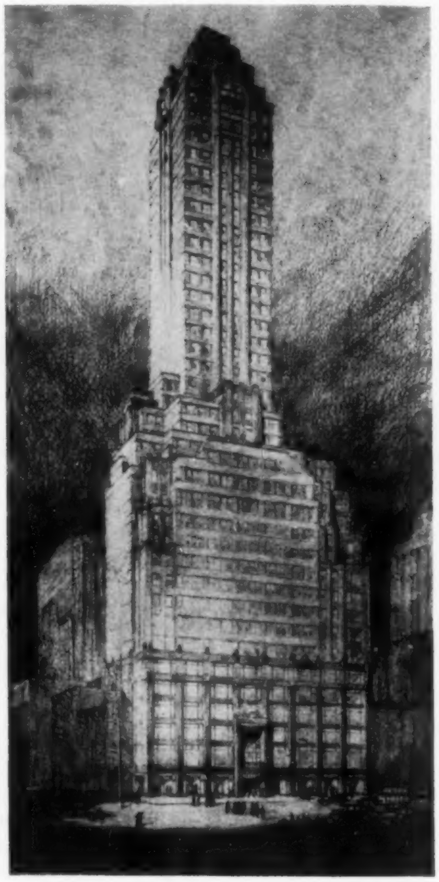
Structural steel is particularly suited to light loads and tall buildings. Although we have approximately 650 reinforced concrete structures in this country that are ten or more stories in height, the vast bulk of such work is of steel. Under the New York code a structural steel frame with cinder-concrete "arches" is a very economical type of construction for normal designs based on office loading of 60 pounds per square foot throughout typical floors. For buildings of over 20 stories in height, steel has practically no competitor in any part of the country. Below that height, offices, hotels and apartment houses in New York are built almost exclusively of steel with cinder-concrete floor arches. In many western cities, on the other hand, even where material prices are no more favorable to use of concrete, the latter has been widely and successfully used for work of this class. Trade conditions and the tendency to follow the established custom of one's own locality, would often appear to play a larger part than the matter of comparative costs.

Second only to the matter of live load, the architectural plan of a building plays an important part in the choice of construction. One of the great structural advantages of reinforced concrete, as ordinarily used, is its monolithic character, permitting assumptions of continuity in design. When the architectural arrangement lends itself to a series of continuous bays of approximately the same size, the use of a reinforced concrete frame may be an economical solution for even light loads and, as previously mentioned examples indicate, will almost always be suitable for heavy loads. The matter of continuity will not, ordinarily, make any difference in the depth of beams or girders, in beam-and-slab construction, but it will save anywhere up to 35 per cent of the reinforcement that they require. Reinforced concrete is particularly suitable for buildings that permit a column spacing that results in square or nearly square bays. As a large proportion of the cost of concrete work is expended on the construction of forms, this material is most economically used for buildings whose structural members can be standardized. The importance of this principle can be judged by the fact that on typical work one set of forms serves in turn for the structural members of each floor, often being used as many as ten times. Neither is it usually desirable to reduce the sizes of beams supporting a roof construction, as the surplus concrete is more than offset by the saving in not changing the forms.

The ideal spans, in both reinforced concrete and structural steel, vary between 18 and 24 feet, depending upon the live load and the type of floor construction employed. In most buildings outside of the industrial and commercial classes, the columns have to follow the room arrangement, and it is seldom possible to use the most economical spacing. As far as practicable, the designer should start with the primary element of a floor system, such as the slab, and lay out his typical floors to use each member to best advantage. We have an excellent example of this principle applied in most New York buildings now under construction. The city code permits cinder-concrete slab or "arches," as they are called, to be used on spans up to 8 feet. A minimum thickness of 4 inches is specified for floors. The designer's problem is then to locate the floor beams, which support the slabs, as closely as possible to the 8-foot limit. As it works out very well to frame the beams into the girders

Master Printers Building, One of the Highest Concrete-framed Buildings. Floors of Girderless Design

Frank Parker, Architect and Engineer



The Fuller Building, New York, Typical of Work Economical in Steel

Walker & Gillette, Architects

at the third points of the girder spans, we have a column spacing which approaches 24 feet if we wish to fully develop the strength of our 4-inch slab which the building code requires.

This same principle can be applied to other matters in the design of structural frames. A 3½-inch thickness of stone-concrete, which is the minimum allowed for roof construction under the present New York code, when fully continuous will carry a 43-pound superimposed load between beams placed on 10-foot centers. The limit of the 4-inch stone-concrete slab, when supporting a 100-pound live load, is 8 feet, 6 inches when fully continuous and 7 feet, 9 inches for end spans. The weight of reinforcement per square foot of floor area naturally increases as the column spacing is increased. For example, a girderless floor system designed under the two-way requirements of the New York code, to support a superimposed load of 125 pounds per square foot, would require 1.85 pounds of steel per square foot of floor area with bays 16 feet square; 2.35 pounds for bays 20 feet square, and 3.10 pounds for bays 24 feet square. These figures are based on full continuity. Considering the cost of footings and columns, the most economical bay would probably be about 18 feet square. Considering the loss of floor space occupied by the columns, the present practice is to space them about 20 feet on centers,—probably a little over rather than less.

For long spans of 40 feet or more, reinforced concrete can be used in either arch or truss construction. Such designs have been cleverly executed both in this country and abroad, but if economy is the governing factor, steel should be used in most problems of this nature encountered in building construction. There is even a tendency to use concrete girders on shorter spans where structural steel would be more economical.

Consider, for example, that it is required to span a distance of 34 feet between masonry walls. If we assume a uniformly distributed load of 100,000 pounds and a floor system capable of giving lateral support, a structural steel girder 24 inches deep and weighing 120 pounds to the linear foot will meet the requirements of the American Institute of Steel Construction. If headroom is not important, we could probably obtain a 28-inch

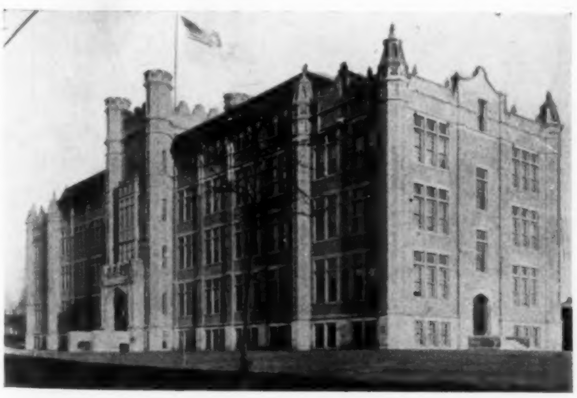
section, weighing 112 pounds per linear foot which would also serve the purpose. In reinforced concrete, a T-beam section, economically designed, would have a total depth of about 36 inches, a width of 14 inches, and approximately 1,650 pounds of steel if computed at working stresses of 650 and 18,000 pounds per square inch for the concrete and steel, respectively. Even these large proportions would have to be greatly increased unless the floor system chosen by the designer provided an adequate thickness of concrete to act as a compression flange. It is also true that the weight of large concrete beams and girders may easily be 20 or 25 per cent greater than that of steel, including fireproofing.

These facts would favor the use of a structural steel frame, or bearing walls with structural steel interior framing, for buildings requiring wide spans. Balconies, such as are found in many auditoriums, may also influence the designer in his choice of structural frame, as such can usually be more expeditiously and economically built in steel than in reinforced concrete.

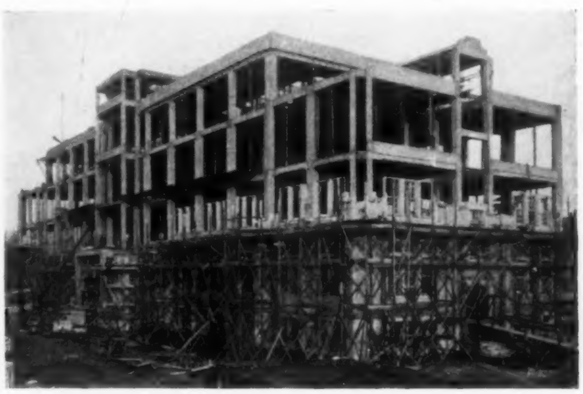
The question, however, is too often decided by making merely a relative estimate of the costs of labor and materials, both based upon the *same design*. A valid comparison cannot be obtained in this way. As far as the architectural requirements permit, comparative estimates should be based on designs which employ the type of material under investigation to its fullest advantage. Reinforced concrete is particularly suited to some forms of architectural expression, and even if it is not possible to actually "express" the feeling of concrete in the form or ornamental features of a building, it is entirely practicable to reserve its use for types of construction which are easily built of this material. The same should be true of structural steel; many architectural offices use steel sections more as a matter of habit than as the result of analytical comparison. Not a few designers look upon concrete as suitable for industrial work, but hardly to be considered for other types of buildings except in floors and footings and as a fireproofing material. On the other hand, there are sections of the country where concrete frames are very widely used for buildings of moderate height even with comparatively light loads. A study of relative costs, as influenced by local conditions, does not seem to justify this difference in practice. From these data, and many similar considerations, we can be fairly confident that both the structural and architectural character of a building should play an important part in determining the type of skeleton to be used.

The design of the reinforced concrete members forming the structural frame of a building is very largely influenced by the code or standard accepted by the designer, and it is not the province of this journal to treat of matters pertaining to the details of structural engineering. The architect is seldom interested in determining the number of stirrups in a concrete beam any more than he is concerned with rivet spacing on structural connections. It is important, however, to know that concrete beams of T-section require about 1 inch in depth for every foot of span; if the beam is of rectangular section, there being no concrete floor serving as a flange, 1¼ inches would be a fair estimate. These figures are based on economical design for normal conditions and could be reduced by increasing the reinforcement if the additional cost were warranted. The width of the web of a concrete T-beam should be between one-half and one-third of its total depth, including the slab. Rectangular beams are usually about one-half as wide as they are deep.

Columns composed of concrete reinforced with only vertical rods are allowed under most codes, to sustain concentric loads computed as 500 pounds or 600 pounds per square inch on the "effective concrete section," the value depending upon the quality of the mixture. The effective concrete section should be taken as the net area,



The Women's Institute Building, Scranton, Pa.
William Lowndes, Architect



The Frame is Reinforced Concrete and the Floors of R. C. Beam-and-Slab Construction

Brick Used Over Reinforced Concrete Frame, Sanitorium Near Atlanta, Ga.
Hentz, Reid & Adler, Architects

exclusive of the steel, allowing 2 inches outside of the reinforcement for purely fireproofing purposes. Some codes, such as that at present in force in New York, allow the effective area to be taken as the *gross* column section, deducting only the space occupied by the reinforcement, which seldom exceeds 1 per cent of the area. The total supporting capacity of the column is then computed, in either case, by adding to that of the concrete the carrying value of the reinforcement, which is considered to support 7,500 pounds or 7,200 pounds per square inch when used respectively with 500-pound and 600-pound concrete.

Although the design of columns with only vertical reinforcement is pretty well standardized, there is no uniformity in regard to spiraled columns. Unfortunately there is some slight justification for computing their sustaining value on several entirely different principles. These have been picked up by the authors of our various building codes and combined with a variety of limiting percentages applied to both the amount of spiral and of vertical reinforcement. Although the present situation is an amusing commentary on our knowledge of this branch of structural engineering, or rather a reflection upon our ability to apply what little we do know, the matter is too technical to be of interest to the average architect. Suffice it to say, that under the New York code a spiraled column, economically designed with 1 per cent of vertical steel and 2 per cent of spiral, can be considered to support 1,466 pounds on each square inch of the core enclosed by the spiral. In other more benighted sections of our country this same column would be permitted to carry only 971 pounds on each square inch of the core. These absurd differences, although more pronounced in the field of concrete design, exist in the ordinances governing use of other materials. There seems to be no particular reason why structural grade steel of exactly the same quality should be considered to carry a working stress of 16,000 pounds per square inch in one city and 18,000 pounds in a neighboring city. The proper remedy for these inconsistencies lies in an honest attempt to make municipal codes conform with good practice. The specifications and suggested regulations promulgated by the American Concrete Institute, The American Institute of Steel Construction, and the building committees of the Department of Commerce, contain much valuable information which could be applied to advantage.

Footings. The study of comparative construction as applied to footings offers an interesting field for the architect who desires to control the major decisions in connection with the structural work, without going into the details of engineering. For all buildings of skeleton construction, whether of steel or reinforced concrete, the problem of footing design is merely to choose the most

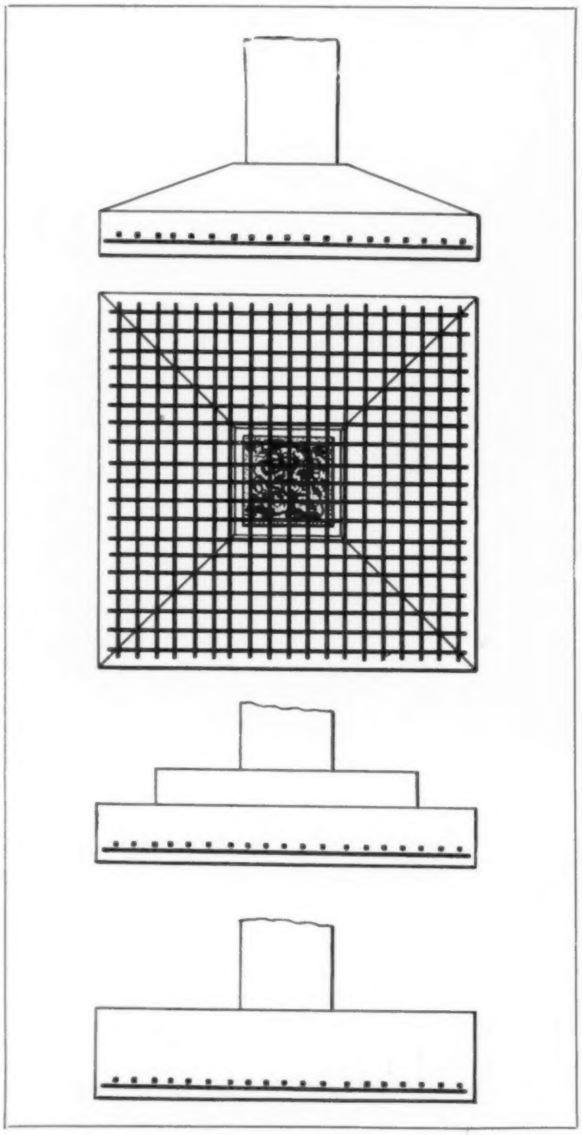
Reinforced Concrete Frame of Building Shown on Opposite Page
Hentz, Reid & Adler, Architects

economical means of distributing the concentrated loads of the columns over an area sufficiently large to bring the load per square foot within the safe bearing capacity of the soil. Foundations upon rock involve one aspect of this same problem, and the use of wood, concrete or steel cylinder piles is only to increase the soil capacity. Independent footings, rectangular and preferably square in plan, of stepped or pyramidal pattern, are normally used to support the interior columns of a building and are also economical for exterior columns of skeleton structures, if there is space outside of the building line to permit concentric design. The chief problem is to choose economical footings for exterior columns when there is little or no space available beyond the building line. With the exception of a type known as the "buttress footing," and not widely accepted, the choice falls on either a continuous, a cantilever or a combined footing.

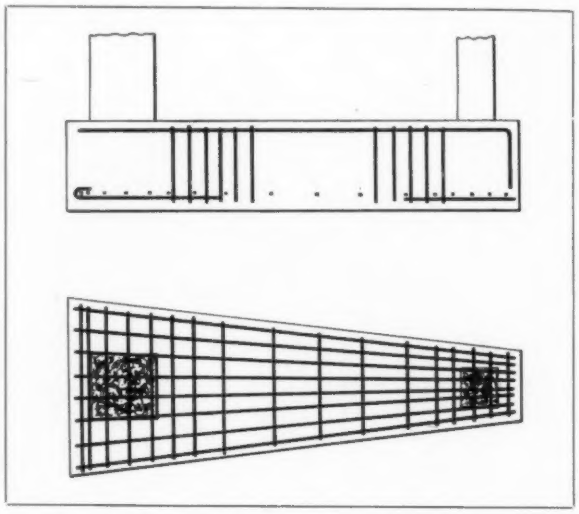
A continuous footing, which is nothing other than an inverted beam loaded with a soil reaction of usually from 6,000 to 8,000 pounds, and supported by the columns, will probably be the most economical if the area available without eccentricity is sufficient to carry the column load. For example, if we are permitted a projection of 1 foot beyond the faces of the columns, which we will assume as the building line, and if the basement columns are 2 feet thick, we can make the footing beam 4 feet wide and still have its axis directly below the column centers. If the column spacing is 20 feet, we then have 80 square feet of available bearing area for each column. If the safe soil load is 6,000 pounds, this type of footing is capable of supporting a column carrying 480,000 pounds with some small deduction for the weight of the footing beam.

The next choice, usually resorted to where no projection is permitted beyond the faces of the columns, and referred to as the "cantilever" footing, is merely the application of a device for overcoming the tendency of the exterior columns to fall outwards owing to the fact that their footings cannot be centered beneath them owing to the proximity of the property line. The design, in this case, is similar to that of an interior, concentric footing but a concrete or steel beam, called a "strap," is built connecting each exterior footing with the nearest interior footing. The strap balances the eccentric moment and holds the exterior footing in equilibrium.

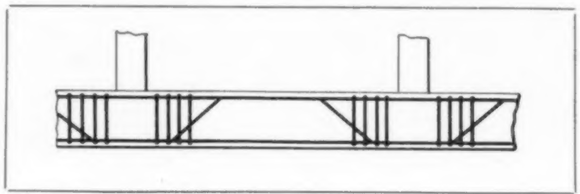
The third choice for the footings of exterior columns adjacent to property lines is called the "combined" footing. Instead of employing a strap, as in the cantilever design, a heavy, continuous slab forms the footing for an exterior column and the nearest interior column. As the name implies, this is merely a joining, or combining of the two footings and is resorted to when



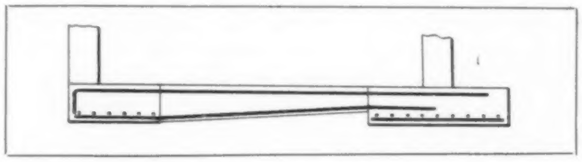
Typical Design of Reinforced Concrete Footing for Isolated Columns of either Structural Steel or Concrete; the Stepped Type is Preferable



The Combined Footing of Trapezoidal Type; Exterior Column at Right of Illustration



This Continuous Footing Acts as an Inverted Beam to Distribute the Loads of Exterior Columns



A Typical Cantilever, or "Pump-handle" Footing; the Exterior Column is at Left of Illustration

it is necessary to overcome eccentricity in an exterior column and use the *entire area* between columns for bearing purposes. When possible, combined footings are built rectangular in plan and extend toward the interior of the building a sufficient distance to insure that the center of reaction of the footing area coincides with the center of load between columns. If such extension is not practicable, owing to the interference of an elevator well, or some similar obstruction, the portion of the footing supporting the interior column, which is usually carrying a heavier load than the exterior, is widened with the result that the footing slab is trapezoidal in plan.

Footings on piles follow these same classifications and are designed in exactly the same way except that the individual pile reactions replace the uniform load assumed as the safe bearing capacity of the soil. Footings resting on rock are designed for loads varying from 15 to 40 tons per square foot, depending upon its hardness. Under our tall steel structures the typical billet and grillage design has become the general practice for foundations carried to hard rock. Where it is necessary to obviate vibration, such as that due to the movement of trains, specially designed vibration mats, composed of layers of lead and sheet asbestos, are employed at the bases of columns supporting buildings over railway tracks.

The next step in planning the structural design of a building is the choice of the floor construction. This subject will be covered in a succeeding article in The Architectural Forum for May.

The illustrations of footings are from "Concrete Building Construction," by Theodore Crane.

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WINTER CONSTRUCTION AND SUPERINTENDENCE

BY

LEICESTER K. DAVIS

THE trials of keeping winter construction going smoothly and on unbroken schedules are over. The vigilance required to meet the attacks of cold and ice and snow has settled down to being a far less difficult matter. It is a good time in which to make a check-up of results secured during that short but difficult period, and for architects and builders to consider the effectiveness of their combined efforts in keeping winter activities going at high levels of efficiency and economy.

The records of superintendence will doubtless settle many questions, show the wisdom of using precautionary specification clauses, and justify closely coupled contacts that follow each step and stage of construction most likely to be adversely affected by winter's influence. The purpose of all architectural superintendence is constructive, not destructive,—the obviating of faults which if not discerned in their early stages result in piling up those disconcerting "extras" always associated with elaborate correction or replacement of work not up to required standards.

The difference between supervision and superintendence is not, perhaps, as fully appreciated as it should be. The former term deals mainly with results and passes judgment according to standards established for completed work; the latter follows more closely each unit of work throughout its progress, giving attention to immediate materials and methods, as well as taking into account those supplementary elements not strictly within the province of the specifications. Supervision stresses final responsibility; superintendence performs a more coöperative service, which begins at the beginning and keeps on to final completion. All architects may not agree upon this grouping of relations, but many do, and it is from the point of view of those who do that distinction is here made in describing the more important specific methods with which architectural superintendents should be thoroughly familiar in order to render the coöperation which contractors welcome and by which owners benefit.

Reading through many notes made during interviews with representative architects, I have been impressed by unanimity of their opinions in regard to winter superintendence. All seem to be agreed on:

1st: The need of many and frequent architectural contacts with winter work at every stage.

2nd: The value of familiarity with the precautionary methods developed by various trades.

3rd: The necessity of forecasting procedure in regard to conditions under which each phase of construction shall go on.

4th: The good to all concerned of thorough understanding between the architect, contractor and owner as to the powers and responsibilities of the architect or his representative in advising or requiring specific forms of structural practice.

5th: The benefits which result from carefully worked out methods by which accurate progress reports of superintendence may be kept for incorporation within a permanent record for current and future reference.

Most architects with whom I have talked emphatically recommend employment of a "clerk of the works" for all construction of any size that extends through the winter months, this individual to be selected by the architect and to be under his direction with services paid for by the owner, and to have duties, powers and remuneration covered by contractual clauses. Maintaining superintendence of this character is a regular procedure in many offices. In others the office personnel includes a "field man" who is assigned, at an extra charge, to work during all or certain winter stages.

Perhaps the first preliminary consideration of the architect in his approach to problems of winter construction should be the preparation of an outline which indicates how his contacts shall be governed. A comprehensive plan, worked out well in advance of the cold weather period, is sure to be of assistance in preventing otherwise puzzling twists and turns. Such an outline need not be elaborate. It should be built about only those definite phases of the work most likely to be seriously affected by lack of proper precautionary methods. It should cover uncertain points with clear indication of possible contingencies and directions regarding the manner in which they should be provided for.

In this schedule of defence, one might well start from a list of materials and uses having definitely known requirements for protection, classifying with each the possible circumstances to be faced. In an analysis of this kind, proper protective ways and means almost automatically suggest themselves for situations that might not be thought of until a crisis in construction had arrived. At this preliminary stage the value of coöperation by an experienced winter constructor will often be extremely valuable, since what are sought are not merely descriptions of "textbook happenings," but rather those out-of-the-ordinary run of things which happen once in a blue moon,

Interior Brickwork and Proper Temperature Control. Note Muslin Covering Door and Window Spaces, and Salamander Placed to Effect Equal Radiation of Warmth

Thawing Out a Snow-covered Pile of Bricks with Steam Hose Should not be Necessary. Brick Should be Stacked with Complete Coverage of Top and Sides of Stack

and which sooner or later may happen again.

One architect with whom I have discussed the subject has made a series of "pre-structural conferences," as he calls them, with winter-seasoned contractors a routine matter, even before specifications are ready for bids. This practice he considers especially important where the construction schedule is to include a part or all of the winter months. By frankly explaining his purpose to prospective bidders, he has gained information regarding precautionary methods which has not only aided subsequent superintendence but has also clarified sections of his specifications covering winter performance. In an outline such as that here referred to, several divisions are quickly established. The first of these will very likely deal with those elements of the structure upon which superintendence should be most thoroughly concentrated. Next, logically, follows the storage of material prior to its use; next, the methods to be employed during and following such use; finally, there will be the general standards of winter practice and the specific forms of protection best suited to the locality and the type of structure. Included in this last should be provisions for "potentials,"—those things which probably will not occur, but which may.

Structural safety is, of course, one of the prime factors with which superintendence should deal at any time of year. There must be assurance of soundness in the bones and sinews upon which a building depends for ability to carry its load. And these, in practically all modern construction are steel, concrete and brick. Erecting steelwork in winter requires few departures from the routine of other seasons, except perhaps extra provisions for workers subjected to hazards and discomforts of weather, wind and bitter temperature.

Construction of concrete and masonry, on the other hand, calls for more carefully worked over methods. The aggregate that slushes to December wall and floor and column forms, and the courses of brick that rise steadily despite numbing January days, are propositions very different from like work carried on in fair and warmer months of the calendar. Winter concrete is a finicky jade, and she exacts very definite forms of attention at equally definite stages of preparation, application and setting. In order to make sure of final structural dependability in concrete, superintendence by the architect or his representative is of the utmost importance from the start to the finish of operations. Freezing temperature is concrete's greatest enemy,—one that is present from the minute the dumped sand and gravel start on their way to the mixer. Therefore the architect's plan of superintendence should include a check-up on provisions made for heating, while actual superintendence should see that the means provided are adequately employed.

Supports Ready for Tarpaulins. The Frames Must be Sturdy to Withstand High Winds. There Should be Projection to Insure Space for Ample Circulation of Warmed Air About the Exteriors of Forms

In Winter Superintendence it is Well to See that Snow Accumulations are Removed Before a Thaw Forms Puddles which an Overnight Freeze May Turn to Treacherous Sheets of Ice

The warming of sand and gravel before they reach the mixer must be thorough and constant,— on small work, by the heat from wood-fired pipes traversing the mass, and on larger work, having considerable tonnage, by spreading the mass over and around grilles or coils of perforated steam pipes, so placed that distribution of warmth is evenly made throughout the material. The mixing water should be kept at tested temperature by a steam nozzle run into the water barrel at the mixer.

These are but preliminaries. It is after the mix reaches the forms that the closest watch must be kept against laxity in maintaining protection of the concrete as it attains the final set. Protective methods for concrete have become pretty well standardized. It is the duty of the architectural superintendent to see that they are employed at the right time and in the right way. Before winter concrete work is begun, the architect and his contractor should be satisfied that apparatus adequate in type and capacity is ready to operate as soon as forms are built. The number and sizes of tarpaulins required should be carefully figured. The methods by which they are to be hung and lashed should be determined. Salamanders in number sufficient to maintain correct temperature under the most trying conditions produced by a record cold snap should be provided. Heat holes in floor and ceiling forms should be properly prepared and spaced for control of covered areas above slabs. The distributive outlets from main steam lines should be placed at the most strategic points.

No matter how well protective equipment is selected, its proper use is imperative. The handling of tarpaulins should be carefully supervised. Their placing should be such that definite areas are included, with perhaps a number of sections throughout the structure treated as localized units, each having its own form of heating apparatus, this obviating risks that always attend the attempt to spread a volume of warmth over a large area in parts of which temperature is certain at times to be lowered perilously close to the danger line. Extra precautions should be exercised wherever structural safety is particularly essential.

Winter superintendence should insist upon a record of day and night temperatures, and with these should be included readings taken frequently at the bases of exterior columns and under the canvas above floor slabs, in order to prove beyond all doubt that protection is being kept at a constant level.

Contractors specializing in winter concrete have worked out well defined rules by which are determined the efficiencies of various types of apparatus used for temperature control. As examples of these, in one locality the protective efficiency of top covers on reinforced concrete

Concrete Faults Due to Improper Winter Precautions. The Criss-cross Cracks Shown Extend Clear Through the Body of the Slabs

Flat Scaling Caused by Concrete Surface Freezing Before Coverage was Applied. The Defect did not Affect the Structural Quality of the Slab

beam and girder construction in ordinary winter weather has been figured at 48 hours as standard for time before coverage should be removed, 96 hours being the minimum for side curtains. Flat slab construction, with more protection required, calls for extension of the protective period. The efficiency of salamanders has also been calculated, it having been determined, for example, that in northern sections temperatures of from 60 to 80° may be maintained by one salamander to every 300 square feet of floor. Heat holes, which permit transmission of warmed air from areas below slabs to the upper surfaces of the slabs, are figured in a similar manner. Each of these auxiliary units should permit circulation of warmed air over approximately 300 square feet of properly "topped" area during average winter weather. Should temporary radiation by steam be utilized in place of or in addition to salamanders, it also can be handled according to rule.

Whatever methods are decided on, their application to the work in hand should be understood by the architect when planning and forecasting the duties involved by winter superintendence. If unusual conditions are encountered, the plan should be flexible enough to deal with them. The thing of main importance, so far as architectural responsibility is concerned, is to be sure that the most effective forms of protection are provided and conscientiously employed. Conditions will naturally occur in which necessity of the moment may demand radical departure from original intent, and in such cases, the superintending architect must act quickly and with decision fortified by judgment. Many architects, if in doubt as to justification of a change in method, feel that the responsibility should be placed squarely upon the contractor, final acceptance being based upon tests for structural dependability.

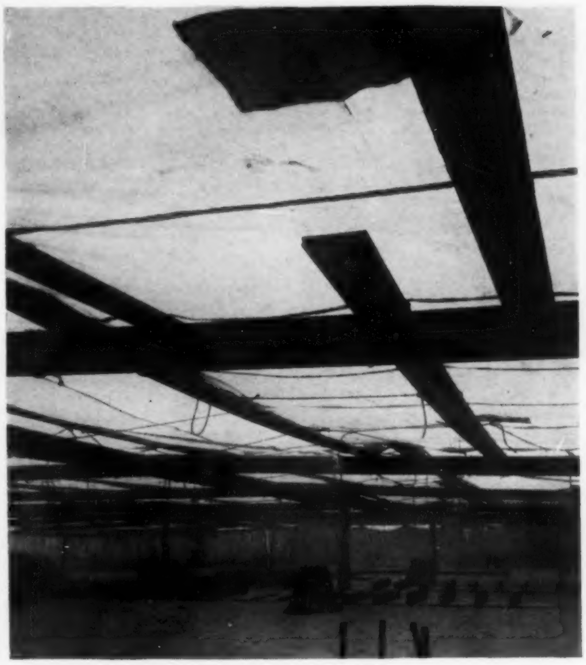
On a recent large industrial project, a decided innovation in the protection of winter-poured concrete floors came to my attention. It may or may not suggest use under similar conditions. In this particular locality it was standard winter practice to cover concrete floors with layers of marsh hay until the set had passed all risk of freezing. In repeated cases the architectural supervisor detailed to the work found that the feet of laborers who spread the hay caused marks and depressions which actually impaired the structural quality of the finished slabs. In addition to this, tufts of hay and other debris became imbedded in the mix as it set, necessitating a "burn off" with fired gasolene before sleepers for the final floor could be placed. The supervisor had used a rather daring remedy by deliberately leaving the wet surface exposed until a skin of ice formed, strong enough to bear a laborer's weight without footprinting. Marsh hay was then applied in the usual way, thawing out the ice sheath before there had been penetration of cold sufficient to injure the body of the floor. Seemingly the only effect from this treatment was a slight flaking away on the surface, possibly to an average depth of 1-16 inch, but the architect should decide whether to allow use of such questionable methods.

Essentials on which to be satisfied in superintending the winter care of concrete are:

(1) Assurance that proper types of apparatus are on hand to provide adequate and constant working warmth for material before going to the mixer, properly warmed mixing water, immediate exclusion of freezing temperature from forms until all risk is passed by the set. (2) Assurance that all apparatus is properly placed and working.

Leaving concrete, we come to brickwork, perhaps the next most important structural element to be safeguarded. In general, the protective measures for temperature control surrounding use of concrete apply to winter brick building. Tarpaulins, salamanders, steam lines, radiation as independent units or in combination, are util-

Temperature Control Assured by Tarpaulin "Topping" of Upper Surfaces of Concrete Floor Slabs. The Manner in which Such Protection is Carried Out Should be Carefully Checked. Note the Snug Overlap Given Exterior Tarpaulins



Interior View of Same Protection Shows Canvas Lashed to Framework. Clusters of Pipes Are Also Shown Projecting through Heat Holes Placed for Effective Distribution of Warmth from Salamanders on Floor Below

ized in much the same way for both materials. With brick, moisture becomes an added factor which winter protection must take into account. Wet brick for summer, dry brick for winter, is the rule. That section of the superintendence outline should begin with the storage of brick at the site. Obviously brick should not be piled helter-skelter as it is delivered from the truck, but should be stacked and covered over by sheds or canvas in a manner that protects sides as well as edges against contact with the weather. The ideal way in which to store brick awaiting use is within one of the areas kept warm by salamanders or other heating apparatus. This serves not only to keep it away from snow or rain but also prevents absorption of atmospheric moisture.

It is well established practice to lay all brickwork at temperature well above freezing point. As with concrete, the materials which go into brick mortar should be prepared and mixed where temperature control is assured.

Inside brickwork seems to offer no great problems where adequate protective measures are planned for and employed. Care in checking temperature to keep it at constant working point is, of course, essential. The desire for comfortable warmth on the part of the bricklayer is an aid in securing proper temperatures for laying brick. With brick laid outside the zones of temperature control, more closely coupled contacts are required than with inside work. Outside joints, which may freeze and "pop", carry a decided winter risk. Various anti-freezing compounds at the disposal of the contractor are valuable when speed of erection is a pressing need. Nothing, however, seems to quite fill the bill as well as good old fashioned mortar, applied with cleanly struck joints, and thin enough to permit compacting that assists in a final set which prevents there being cracking or leaky walls.

Many experiments have been carried out in an endeavor to find an ideal cold weather mortar. A test result and recommendation were published some time ago by the National Lime Association. The Association's report said that "lime cement mortars are least affected by cold weather when mixed to a formula of 1 part cement, 2 parts lime and 9 parts sand." The advantages stressed in its favor are: increase in tensile and compressive strength under low temperature; plasticity and ease in handling during winter weather; ease in proportioning; and low cost. The architect should investigate the mortar mix thoroughly. It has become widely accepted practice to defer laying outside brickwork in winter when a falling temperature reaches 34°, and to begin only when a rising temperature has reached that point. Brickwork known to have been frozen should not be built upon until most thoroughly thawed out, and portions in which frozen mortars might later cause disintegration should be torn out and replaced. Outside brickwork in


All-over Coverage Given a Municipal Pier which Was Completed on Scheduled Time Through a Winter of Record Cold and Snow. Behind the Tarpaulins, a Carefully Worked out Radiation System Provided the Requisite Heat

winter should be protected by tarpaulins for three days after laying, with temperature maintained well above 32°. So much for winter brick and brickwork as they must of necessity be treated here.

As winter construction progresses, various auxiliary structural elements begin to play their parts. Not all of them, by any means, require special winter consideration. But those in which water is used should be on the list of those that demand use of precautionary methods. More and more tile work is being used in the architectural-structural scheme of things, and when in winter its application becomes extensive, cold weather precautions must be taken. Temperature has an important bearing upon the enduring success of the winter-laid tile. Experienced tile contractors know that tiles set at or below freezing point will sooner or later come down of themselves. A conscientious rule of practice regards 50° as the ideal temperature for setting tile in winter, with maintenance at about that point for 48 hours after the tiles are in place. Work should stop immediately when the thermometer registers close to 32°.

Exterior tile work should never be carried on when there is even a remote possibility of there being freezing weather. Anti-freezing compounds are not very popular with most tile men. Those with whom I have talked discourage their use, claiming that results have not been satisfactory and that staining of the tile face is likely to occur. Tile body, like that of brick, absorbs moisture readily, and in winter, tiles should be kept as dry as possible before application, within areas where working temperature is maintained.

Plastering is another phase of work which should be safeguarded against too low a temperature. Luckily, plastering is usually done when winter construction has reached the semi-finished stage, when necessary temperature is easily provided and kept constant.

With a clearly defined plan of procedure to follow, effective winter superintendence is not difficult for the thoroughgoing architect. The measure of its success depends largely upon having a clear idea of what is to be encountered, of knowing in advance the reactions of given materials to winter conditions if left to themselves, and of knowing what must be done to prevent these reactions from taking place.

In an article such as this some mention should be made of the effect of winter superintendence upon the attitude of the craftsman toward his work. The success of winter construction is not wholly dependent upon adherence to rules and standards for the storage and handling of material. Securing the comfort, safety, and team spirit of the men who do the work, from the pick and shovel gang on up the line to division foremen, should be a substantial part of the architect's superintendence plan. In his contacts he should be on the alert for any difficulties which might impair morale, and be quite as frank with recommendations for their correction as he is in matters of purely structural interest. I know the stimulus which follows an architect's mingling with rank and file of workers on a cordial common ground; the impetus that follows his showing more than an impersonal interest in a craftsman's efforts; the support he receives when it is understood that he is there to do his part in creating a structural success for everyone concerned.

BUILDING PROMOTION FROM THE BUILDER'S STANDPOINT

BY

WILLIAM A. STARRETT

WHAT THE TRUE BASIS OF PROMOTION SHOULD BE. FINANCING METHODS, GOOD AND BAD

IT is needless to say that I was flattered to receive an invitation to come to Chicago, particularly to speak to architects. We in the East feel that the leadership in sound promotional ideas comes out of the West.

One such idea is that of financing buildings by the issue of so-called "leasehold bonds." In the State of New York, and I believe in two other states in the Union, securities that are founded on leaseholds are not accepted by fiduciary institutions as investments for trust funds, thus limiting the use of this method of financing, which is, when soundly planned, about the best and most advanced form of real estate security.

There is a legitimate and alluring field of endeavor for those interested in architecture and building in connection with the financing of building projects. We builders and architects hear of and see many that are meritorious. We know the great increment in value that comes about through our active participation in worthy projects. It is well, however, to remember that we hear most of the successful cases of building promotion, and that very little is said about the unsuccessful. We can always point to examples where great profit has accrued; but we should not forget that the path of this whole matter of promotion is strewn with wrecks of failure, and that bankruptcy courts silently carry on, without front page publicity, the foreclosure enforcement of liens.

Land Worth What It Can Be Made to Produce. Now the true basis of promotion is really the putting together of two valuable components of a creative enterprise. We have on the one hand a piece of land, either vacant or encumbered by obsolete buildings that must be destroyed in order that the land may realize its economic value; and we have on the other hand a brilliant conception of a great improvement which might be made,—the land to be worth so much and the building erected to be worth so much. The sum of those two will be so much; and no matter what it costs, within those reasonable limits that we here discuss, there has been an increment the minute the key turns in the doorway it is opening. Therein lies the lure to the promoter and the legitimate profit in the thing we are here considering.

Now, here is a thing builders and architects are tremendously concerned in, because we help to create that happy combination by bringing together an unproductive or absolutely unimproved piece of land and the highest possible improvement for that piece of land. It would be an impertinence in the presence of real estate experts to suggest a short cut in the matter of appraisals, for we have all used land appraisals of other generations and running down even to very modern times;—that method of calculation which compares what another piece of land cost with that of land under consideration, without reference to the earning power of the newer project. Out of such a circumlocution of appraisal, we finally come to the solemn moment when the appraiser grudgingly says that our project is worth only about so much. However, I dare to pronounce a bit of dictum as a short cut for the whole thing, by saying that land is worth what it can be made to produce. If you want to be very meticulous in your definition, you may go on to say: "What it can be made to pay over a period of years"; but it is all said in those few words;—land is worth what it can be made to produce,—its earnings. And therefore the builder and the architect, in their skillful, constructive activity, create a part of that increment.

"Cost" and "Value" Defined. Now, this brings us to the crossroad which might be regarded as a dilemma, and sometimes taxes the consciences of us who may not think carefully and cleanly (I should say clearly) in these matters. The difference that must be recognized, and the first thing, is the difference between *cost* and *value*. Cost, however, is the sum of those actual outlays of cash necessary to produce and complete the whole; that is cost of the operation. The value of the operation is the complete thing,—the cost increased by creative effort that has been put into the operation by the work of the builder and the architect.

The Wrong Sort of Promotion. Promoters are of so many different kinds that one must almost define it every time he uses the word. Considering that type of promoter whom I should describe as reckless, but who calls himself a conservative, we think of him as reaching down into the very bowels of the building business, and with prospective values and deferments in payment, he ponders on that as a possible ground upon which to build his slender project. He thinks of engaging the efforts of the architect and the builder, and then reaches over the shoulders of both and proposes to engage the profits and the support of all the subcontractors involved. I have found this to be the case,—I am not speaking of territory

with which I am not familiar, but in my own part of the country we find that the greatest mistake among promoters is that which leads a promoter to think that he can reach over the shoulders of the architect and builder and assess the subcontractor for a large percentage of the cost of the work. Here is the way that thing works, speaking for my own part of the country. Take items like structural steel, elevators and perhaps one or two other major items, and you find concerns vending those materials are able to take any part of the financing they say they will take. It is also to be observed that they carefully scrutinize the terms, and prices generally run correspondingly high. Beyond that, there is in the whole industry running down the line, a tendency to lean on the architect and the general contractor for advice, or rather for assumption of advice, concerning the taking of securities. There are 50 or 60 or sometimes as many as 75 subcontractors that enter into the making of a large, complicated, metropolitan structure. You have a great army of those people, ready to take any kind of paper offered, as a portion of their profit. Now what happens? If I could show you into the treasury departments of a dozen of the leading builders of this country, you would find a very sinister state of affairs. You would find there men who promised to take anything in the way of paper and deferments, who are suddenly confronted with the fact that, after all, arithmetic on their books will not produce dollars,—and this is one of the fruitful sources of bankruptcy. Men not skilled or versed in this matter of deferred payments agree to take almost anything, and thereby damage and demoralize their own industry by these rash promises, which, of course, meet a judgment day sooner or later. I think, therefore, that one of our pernicious growths in this matter of promotion is the feeling that there lies, in the subcontractor, an almost untapped source of wealth. As a matter of fact, it doesn't lie there at all. It is detrimental and pernicious to undertake to extract by means of promises of subcontractors, part of the financing requisite for such operations.

We all know, in this swift transition that has passed through the business, that borrowing is necessary for metropolitan development, and indeed it has become one of the fundamental sources of our strongest outlets for capital. Insurance companies for years made loans when skyscrapers were early being introduced; they did it with a considerable amount of what they then thought was risk. It has turned out, of course, as we know now, that there was no risk to it. Nevertheless, there is every credit due to those early institutions for the courage and forward-looking point of view that made possible the financing of these earlier constructions, when, as I have said and as many of you remember, buildings of even 12 stories were regarded as dangerous. More recently in the development, however, we have come upon the investment banker, or rather he has come upon us, and he has come out of a certain situation. In moments of pessimism I sometimes think no new idea ever entered the minds of the comptrollers of insurance companies after the year 1900. The absurd point of view, arising out of that ancient fetish that occurred with the first skyscraper and was met by the courage of that time, has made the lender feel that he is extending a tremendous favor to the borrower, even though the security were as high as it is in conservative lending. Of course, being of that class which benefits by borrowing, I naturally whoop it up for anything that produces larger loans. Nevertheless, I want to say that there is a responsibility there that I think has never been squarely met by the so-called orthodox lending institutions, and that is this responsibility: When an owner (and let's call him also a promoter, because we are also speaking of that) has found a project meritorious, creative, needed and necessitous, if you please, and goes to an orthodox lending institution, and is told that his estimates are too high and that the architects' fees ought to be cut, and that his allowances for this and that and the other thing should all be pared down to arrive at a figure which is not only the cost but something below the cost; then when the loan is made on that basis, with no creative vision, and the owner is forced to the very edge of his financial scheme (and it is not without historical record that often an enterprise entered into hopefully by people intending to avail themselves of loans, has actually been wrecked through the very paucity of the loan, where a proper, forward-looking, optimistic view of the merit of the project would have given a better loan, without one particle of disparagement of the value of that loan or its security), then, I say, the lender has much to answer for.

Investment Banking. Of course we know that out of that situation we have evolved the "investment banker." He has been the subject of all kinds of speculation. We have even had one or two go to the wall, but it is no more an indication of unsoundness of investment banking than the failure of a single bank is an indication of the unsoundness of our banking system. What really happened was this:—that out of this lethargic situation of old time lending there was created an institution that would come in with vision and foresight and see the potential value of putting together the vacant land and the completed structure. That situation produced, our investment

banker has rendered an inestimable service to architecture and the building industry. Cities everywhere have been benefited by the splendid vision and foresight of those investment bankers; and if we can point to an occasional failure, we can also point to a great number of successes.

Sound Projects Should Be Encouraged. We are here together at least for one brief evening, taking to ourselves the virtue of being creators, and it seems a proper occasion to make a mighty protest in favor of the reliable, well organized, capable architect and the builder. These people, as I have said through the burden of this talk, do a great creative thing. It is scandalous that they should be subjected to the losses and disappointments and be pushed out on the end of the limb at the very last quarter of these creative enterprises, in reality and truly carrying the burden of the risk. That's what happens when you put your fees in as part of the enterprise. There is a mission in the whole architectural profession. The architects and the builders are really doing a creatively helpful thing and are entitled to a rightful share of the emoluments of the project by reason of their having taken the great risk involved. We can almost talk unionism when we get on that subject, though we are not going to do it; but I say, as of other matters connected with the ethics of these two professions, that there is no greater field of effort, no more fruitful field of effort, than the constant, everlasting harping on that particular thing, and a demanding on behalf of architects and builders, of a fair share of emoluments of the enterprise, they having really assumed the major risk therein.

This business of promotion is also new; just think of it! We can all hark back to those days, here in Chicago, when a 15-story building was really a city wonder. The evolution and metamorphosis of the whole industry have precluded the possibility of getting down to a code of standard practices, but I think the time has come, and in fact enough has been developed out of the many great metropolitan structures that have already been built, for us all to find out what the standards,—at least the major standards,—of practice should be. It starts with questions of credit, questions in which bankers can help, questions in which realtors and bankers can take a sympathetic interest. Their attitude toward the high ethics of these two professions will in the end tend to stabilize the business. We want promoters. A promoter is a most valuable factor in the economic forward progress of this country. The wrong kind of promoter is just as wrong as you want to make him, and the good, legitimate producer, who sees the values to be created by putting together the unimproved land and sound, well-thought-out building projects, is an asset and and institution of great value to us. My whole urge in the matter is this: With these fundamentals perhaps a little better understood, there could be no better objective for all of us concerned than to stand out for a higher, more ethical and properly fashioned standard for promotion; for the exposing of flimsy, unsound promotion and enterprises.

There is a back-kick in all of this promotion business, which need hardly be referred to. It is the last straw that always breaks the camel's back. Builders have an old saying: "All money lost in building is lost in laying the thresholds." That has particular significance with reference to unestimated items such as delayed receipts of rentals, unexpected necessary expenses that come up in connection with renting, etc., disappointments that are only temporary, in connection with renting during the first months of a building's occupancy. We must consider not only the value created between the cost of the vacant lot and the finished building, but also those items of expense necessary for the closing of that last gap, and the provision for them demanded of the promoter, so that those investments we make of our fees and time in the equity, will be productive in accordance with the great effort which we put into it.

Editor's Note. This article by the vice-president of Starrett Brothers, New York, is based on his address recently given before the Chicago Chapter of the American Institute of Architects.

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THE PAINTING PROBLEM AND ITS SOLUTION

BY

W. C. WOODYARD

HIGHER standards in living conditions have demanded a correspondingly greater refinement of finish and decoration. Whether it be the home, the school, or place of business, we find ourselves taking a fleeting, momentary pride in its exterior architecture, while living all day inside with decorated walls and woodwork. These may produce a refining influence, foster *esprit de corps,* and inspire pride, or the opposite reactions,—disappointment and depression. The value of this idea is well illustrated in the modern skyscraper. Almost without exception the 35 fine Chicago office buildings built in recent years have been trimmed in genuine mahogany or walnut. Almost without exception, the wood carries a highly polished, piano cabinet finish. One of the largest leasers of Chicago loop property, in specifically demanding a piano-like finish, declared it to be one of the differentiating marks between an "A" and a "B" class building. This trend toward refinement of finish and decoration in the office building, the theater, the school, and particularly in the modern home, is so evident as not to require elaboration. The value of attractive and effective surface protection is accepted. It is easy to visualize the result desired, and comparatively easy to define what is expected, but the problem of getting these results is a matter of interest if not of perplexity to the architectural profession.

It is the purpose of this article to analyze the factors contributing to this perplexing situation, with the hope of suggesting a tried and proved policy which will insure more uniformly satisfactory results. With proper procedure, we may deal, first, briefly with the situations which reflect lack of understanding and thoroughness, and secondly, more comprehensively, with the situations in which apparently sound theory has not vindicated itself in practical results. Careless and unstudied specifications deserve only passing mention. Obviously, it is only human that a painting contractor would readily take advantage of one who reveals an inadequate knowledge of requirements. Such specifications lead to costly bartering on the job,—bartering in which the architect and the client invariably lose. We are not warrented in condemning painters as a class, and assuming dishonesty on their part. The whole problem is frequently dismissed in this manner, and unfairly so. We shall make more constructive progress, for the purpose of this discussion at least, if the architect assumes responsibility for the situation and for the improvement thereof.

It is recognized that no trade offers the possibilities for evasion, substitution, and dishonest practice that the painting trade does. Sufficient reason, therefore, to tighten up all along the way in the method of specifying, contracting, and supervising painting work. This is the only way to give the better contractor, who takes a pride in his work, a chance. In general, pride in workmanship is an inherent quality in all of us. It is unreasonable and unfair to assume, therefore, that the painter is not motivated by a desire to do good work. If, however, there is evidence to the contrary, and one will search deep enough for the cause, it will freqeuntly be found that the painter is forced by circumstances to depart from his ideal in order to survive. The better painting contractors will welcome the tightening-up policy which will enable them to do a type of work more satisfactory to all concerned. The "human factor," or the reaction of the painting contractor to specifications and superintendence, is all-important in considering this problem. The painter is a very human, understanding sort of fellow. As a matter of fact, when he makes up his bid he usually has to take into consideration three things,—first, the plans and specifications; secondly, the architect involved, and what he is likely to exact or fail to exact; and thirdly, how far his competing bidder is likely to go in discounting both of these factors. Too often, instead of being given a definitely lined-up proposition, the painter is asked to gamble in competition with others confronted with the same alternative. The general contractor contributes to the unsatisfactory situation by seemingly being interested only in the lowest possible figure, and the only hope for the trustworthy painter lies in a more careful definition, enforcement, and discrimination among painting contractors on the part of the architect.

Now, we may logically turn to certain constructive suggestions which a broad survey of painting problems reveals as the more outstanding causes for unsatisfactory results. Specifications should be varied according to the cost of the building and the general line-up of the investment. A greater proportionate decorative expenditure is expected, for example, in a $60,000 residence than in an ordinary apartment building yielding a moderate income. In the latter case, a decorative result approaching in appearance the effect secured in the $60,000 residence is desired at a considerably smaller expenditure,—and it is possible to secure it. However, the curtailed specification is usually more difficult to write. The element of serviceability is necessary to both projects. It is true,

and generally so accepted, that there is no economy in letting down on the quality of materials used. This would result in a very negligible saving,—a saving that would prove very expensive in the long run. The quality of materials, in fact, looms more important in the curtailed job. A five-coat rubbed enamel job may be cut down to a four-coat eggshell or a three-coat enamel job if necessary. The proper selection of coating in a three-coat enamel job is very important. Likewise the size, three coats of paint, glazed and starched wall coating job may be cut down in the extreme case from six coats to two coats,—a coat of primer and a coat of paint. In each instance it is not claimed that an equivalent job is secured, but a decorative effect approximating the more perfect finish is had, and if the best materials are used, it is one that is reasonably durable and serviceable. On a large apartment hotel recently, an architect wrote a curtailed painting specification, specific as to requirements in coats and materials, that was practically fool-proof. He emphasized to the six contractors he had bid on the work that it represented exactly what was wanted. There was less than a 7 per cent differential between the highest and the lowest bid. It is not an uncommon experience for the highest figure to be double the amount of the lowest figure. This represents a pretty large difference in appraisal of what is desired or will be exacted. It relegates the bid to a gamble. It represents a rather important need of the "tightening-up" process heretofore alluded to.

The practice of cutting bidders down to a price, likewise offers a poor investment. We need not expect to get more than we pay for. It is far more logical and business-like to change the specification, know exactly what one is going to get, and be in a position to insist on the terms of the contract. Of all the evils in connection with the painting problem, the one most complained of is substitution of cheaper materials for those specified. This may be done in an underhanded way, such as displaying boldly a few cans of the specified materials and actually using cheaper materials from barrels, refilled cans and the like, or it may be more above-board,—in out and out requests for approval of other goods. In the latter event, regardless of how represented, the material offered for approval is practically always cheaper in price and quality.

We must first look to the specifications for improvement in this regard. Here again, the human factor plays a prominent part, and the manufacturer's representative can play a constructive role. Let us trace the reaction of various types of specifications. First, consider the specifications calling for several brands "or equal." On the face of it, it appears theoretically sound. It is intended to leave the matter open to competition.. It must be recognized, however, that materials such as paint, varnish, enamel and lacquer, with their complex chemical make-up, are not "equal" in quality or performance. The paint industry exists on a highly scientific basis necessary to meet the ever-increasing demand for a greater variety of paint finish. Products made from the same basic ingredients frequently differ widely in qualities of finish and durability. The large expenditures for laboratory research and control, which constitute quite an item in this age, have found their justification in a greater refinement of finish, flexibility of use, and durability of results. A manufacturer establishes a reputation for progressive research and integrity of purpose. Competition in quality fosters research, whereas an accepted theory of equality would prevent progress. Added to that is the fact that usually one or two of the brands included are cheaper, which automatically makes them the standard of materials for the specification, and nullifies any value in including the higher priced brands. Furthermore, it tends to eliminate possible coöperation from the manufacturer's representative. The representatives of the manufacturers mentioned may be successively stalled off if the contractor chooses to be evasive. In any event, the salesman selling the job, whether it be of the grades specified or otherwise, is entirely indebted to the painter for the business and is likely to be in no position to coöperate effectively with the architect in the interest of the finished result.

We may go from this type of specification to the other extreme. Unquestionably, the exclusive specification offers the most definite proposition for the bidder; likewise a definite basis, an obligation in fact, for the manufacturer's representative to interest himself in the result which should be secured with his materials under the provisions of the specifications. This system has proved to offer the best investment and protection for the client. The plan, however, is objectionable to many because it does not leave the matter sufficiently open to competition. It is frequently maintained that the manufacturer would use this advantage to hold up the price to the contractor. That contention, however, is not substantiated by fact, and where made it should be carefully run down. The larger manufacturers have so many jobbers and independent, overlapping methods of distribution in the various communities that they create competition within their own representatives' ranks and make it practically impossible for the painter to be held up on price. Furthermore, it would not be sound business tactics for the enlightened, reputable manufacturer in this age to be so shortsighted as to take advantage of an ex-

clusive specification if it were in fact in his power to do so under his distributing arrangement.

However, if we seek a specification that offers a uniform standard of materials for each contractor to bid on, which provides for competition, which definitely eliminates the bartering for approvals after the contract is let, let us consider this plan. Definitely specify the product which you believe best adapted for the work, as you would probably do if you were writing a specification for your own home, incorporating as a part of your specification these clauses: "The bids to be considered must include a bid on goods herein specified, but the contractor may submit alternate bids on materials which he considers fully equal to those specified, provided he appends the name of the manufacturer and explicit designation of each product he offers as a substitute, stating the amount to be added to or deducted from his bid for such substitution. The architect reserves the right to award the contract to the lowest bidder on the goods specified or on any accepted substitutes proposed in the alternate bids submitted as just explained. After the award is made, no substitution of materials for those mentioned in the accepted bid will be permitted."

The basic bid on the standard set up commits all contractors to one figure on exactly the same thing, permitting a fair comparison of figures. The architect is not put on the defensive, later on after the contract is let, with requests to approve this or that material, the purpose of which request is usually to offer a saving to the contractor. If there is a saving to be made in the use of an alternate, architect or owner should get the benefit of the saving. How often is there an allowance offered with the request for an approval under the open specification? Furthermore, the matter is definitely settled when the contract is let. The numerous time-consuming requests for approvals are obviated. It is not left to the superintendent on the work to pass on materials, as is frequently the case. Best of all, it is a protection to the better element among the painting contractors who prefer to use the better grade products but hold mental reservations regarding the grades of goods some of their competitors would try to put across if they got the contract.

We cannot deal comprehensively with the painting problem without some reference to superintendence of the work. The plan and specifications may be worked out most painstakingly, and their effect be completely lost, as is so often the case, by laxity and lack of system in their enforcement. We cannot hope to deal with the subject of superintendence in an entirely adequate manner in this article of small extent, but these suggestions to the architect's superintendent may prove helpful:

(1) Definitely familiarize yourself with the scope of the specifications, particularly as regards to coats and materials.

(2) Learn definitely from the office what materials are to be used if the specifications are not explicit. Check up definitely with the office any details regarding which there is uncertainty, such as color, decorative schemes, etc.

(3) Make brief outline of specifications in your note book, particularly the sequence of coats and materials to be used.

(4) Go over the specifications and details of the work with the painter when he first comes on the site. It is essential that both know that each understands that which is to be done.

(5) Provide the painter with a room for storage of painting materials, retaining a key to the lock of the door.

(6) Make regular inspections of storage room, taking care to identify contents of unlabeled cans. Reject and have removed immediately from the site materials not in accordance with the specifications. Look for the original seals on goods.

(7) In the early portion of the work, observe opening of a new can and application of each coat for at least one room to establish a standard result for the entire work.

(8) Check painting work regularly, requesting information as to the particular coat being applied and record data in note book for later use.

(9) Be as careful in the check-up toward the end as at the beginning.

We have made only scant mention of the manufacturer's representative, and the part he can play in improving painting conditions. If he is a product of the modern school, which increasingly demands a more thorough and technical knowledge of the business, he can prove to be quite an asset. Ask him for suggestions in connection with specifications. If you are specifying and using his products, feel perfectly free to insist on his following up the work and coöperating in getting a creditable result. You have a right to expect his interest to be more than in a sale of gallons of material; he should be interested in selling results.

We have gone to some length to suggest a tightening-up process as a means of improving painting work. We have suggested taking into account the human factor and making it more difficult to discount the intent of the specifications. These steps are necessary if the better element in the painting contracting business is to triumph. The better painting contractors will give a sounder investment, and will give added meaning to the common slogan of the paint industry: "Save the surface and you save all!"

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SOUNDPROOFING APARTMENT HOUSES—PART ONE

BY

V. L. CHRISLER

ASSOCIATE PHYSICIST, U. S. BUREAU OF STANDARDS

SOUND insulation is one of the most important details to be considered in building hotels, apartment houses, and office buildings. In the past little consideration has been given by architects to this necessary requirement. There is, however, on the part of the people who occupy these buildings, a growing demand for sufficient sound insulation to ensure a reasonable degree of privacy. Sounds which come through the ceilings are especially annoying to the person hearing them. In many cases the noises coming from adjoining apartments finally get on the nerves to such an extent that a tenant moves, though his apartment may be satisfactory in all other respects.

Up to the past four or five years there has been little reliable information available on this subject, and our present knowledge as to what is the best type of construction is somewhat limited. Many people have thought they had a perfectly satisfactory type of construction, and some buildings which they completed were pronounced satisfactory. Possibly the next building, which was constructed as nearly as possible in the same manner as the others, would be a complete failure. On account of this uncertainty and in order to get comparative data on different types of construction, the Bureau of Standards several years ago constructed a special building (Fig. 1) in which measurements could be made determining numerical values for the sound insulation of different types of construction. Most of the common types have been tested, and considerable work has been done in making various modifications in wall and floor construction so as to get the necessary degree of sound insulation. The problem as a whole is very interesting, as there seem to be so many unknown quantities that it is generally impossible to predict with any degree of certainty whether or not a partition will be a better sound insulator if certain changes are made in it. Owing to the work which has been done during the past three or four years, it is possible to make a much better guess than when the work was started,—but there are still many elements of uncertainty.

It may be of interest to consider some of the factors which enter into the transmission of sound through a partition and to see how they may be controlled. To begin with, suppose we consider a sheet of metal which is fastened over a hole in a wall. If a source of sound is placed on one side of this sheet of metal, the sound energy is carried to the metal by the air, and the sheet is set in vibration. This in turn sets the air on the other side in vibration, and the sound energy is thus transmitted from one side to the other. By studying the sound transmission through a number of sheets of different metals, it has been found that the weight per unit area is, generally speaking, the most important factor. It is not the only factor, for a sheet of lead will transmit sound more than a sheet of iron or aluminum of the same weight. This difference is not large enough, however, to be of much practical importance.

In studying these thin sheets of metal, a very surprising result was found. A year or so ago a few double masonry walls were built and were found upon test to be quite effective as sound insulators. In fact the conclusion was reached that air was the best filling material. Sabine also reached the same conclusion. From these results it was then expected that two sheets of metal separated by an air space would be a much better sound insulator than a single sheet of metal. Much to everyone's surprise, it was found by experiment that two sheets of aluminum with a 1¾-inch air space between them transmitted almost as much sound as a single sheet of material. It thus became evident that the behavior of a double masonry wall was different in kind rather than in degree from that of a partition composed of two thin metallic sheets. The thin sheets of metal apparently need something in the air space between them to help damp out the vibrations. Filling materials, such as hair, felt, cotton and balsam wool, were tried and found effective.

From these results and other measurements on walls, there may be drawn some conclusions which appear to be more or less general. As long as a wall is constructed of masonry and is more or less homogeneous, the sound insulation is almost proportional to its weight per unit area. This means that to get a proper degree of sound insulation the wall must be excessively heavy. To avoid this we may split the wall into layers, and in some way try to damp out the vibrations and prevent them from passing from one layer to another.

One such method which has been devised is to hang the wall and ceiling surfaces on springs which are attached to the main part of the wall. The springs are supposed to act as do shock absorbers for an automobile. They must be of just the right strength and stiffness, so that the wall surface can vibrate without transmitting too much energy to the main part of the wall. This principle was illustrated in some of the first measure-

ments that were made at the Bureau of Standards on stud partitions. One partition was covered on both sides with expanded metal lath and a very thin scratch coat of gypsum plaster. The second panel was as nearly identical as possible, except that it had both a scratch coat and a brown coat of gypsum plaster. When the measurements were completed, the results were found to be somewhat surprising. The panel with the scratch coat only was found to be the best sound insulator. An examination of the two panels showed that the panel having only the scratch coat had a surface so thin that it had no rigidity and could easily be moved back and forth between the studs for perhaps an eighth of an inch without exerting an appreciable force on the studs. The panel having both the scratch and brown coats had a more rigid surface and could not be moved so easily; hence a force exerted on this surface was also exerted in considerable measure on the stud, and was thus transferred to the other side.

The reasons are now apparent why the scratch coat was the best insulator. It had sufficient mass in its surface to prevent the sound setting up vibrations of sufficient force, so that the air between the studs would act as a good tie, as in the case of thin sheets of metal; also the damping in such a surface is fairly large, and the energy would not be carried very efficiently to the stud and hence to the other surface. Moreover, what little energy was carried through was not sufficient to produce any great amount of vibration in the other side, as the movements produced in the stud were but slight, and the opposite scratch coating was not stiff enough to be set into vibration by small movements of the stud. In the case of the panel having the scratch and brown coats, the sound waves which set the first surface in vibration caused the second surface to vibrate also, as this surface was stiff enough to form a rather rigid connection with the studs and thus could be put into vibration by a small motion. From this experiment we see that if the surface can be attached to the main part of the wall so that it is free to vibrate without transmitting too much of the energy to the wall, we have an ideal condition. To accomplish this, one company which is specializing on sound insulation, is supporting wall surfaces on the special spring mentioned here. By another method which is on the market the wall surfaces are supported on small metal chairs, which are lined with felt. In addition to this a lining of hair felt is used between the main wall and the plaster surface. Neither of these particular types of construction has been tested by the Bureau of Standards, but it is expected that either should give good results.

A special type of masonry wall which has been tested in several different combinations by the Bureau of Standards, and which promises to give very satisfactory results at relatively slight increase in cost over ordinary construction, consists

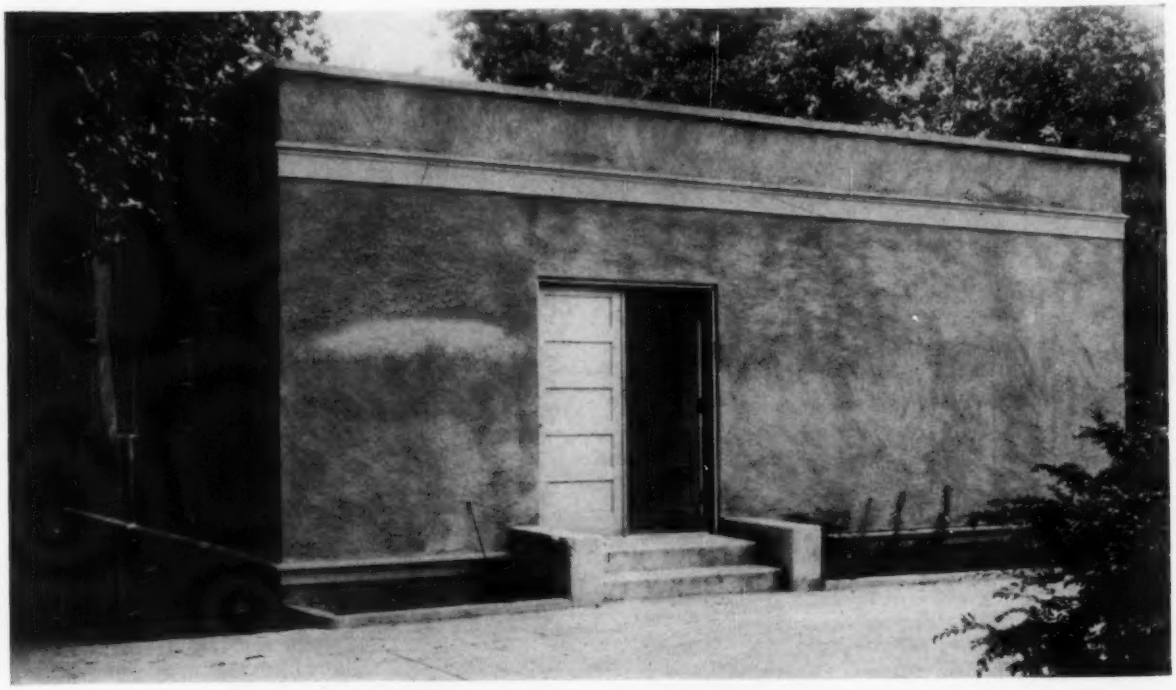


Fig. 1. Special Building of the Bureau of Standards for Testing Sound Insulation.

of a masonry core of 4-inch hollow clay tile or brick turned on edge for the center portion. If the wall is a load-bearing wall, a heavier construction could be used and probably still better results be obtained. At the time the masonry wall was laid, wires were placed in the wall so that wooden furring strips could be tied to the wall 16 inches on centers. The plaster base was nailed to these furring strips, and plaster was applied in the ordinary manner. For the plaster base expanded metal lath was used with tar paper behind it to prevent the plaster from forming a bond with the masonry core. Two different kinds of fiber board and a gypsum plaster board were also used as a plaster base. Where there was a direct comparison, the fiber and plaster boards showed a slight advantage in sound-insulation value over the metal lath as a plaster base. This difference was not large enough to be of much importance, and was probably due to the fact that the plaster was only half an inch thick over the boards while it was seven-eighths of an inch thick when metal lath was used, and as a result gave a somewhat heavier surface.

When the panels were in place, conversational tests were made as well as a determination of the reduction factor. In every case it was found that a conversation carried on in an ordinary tone of voice was barely audible to a listener on the other side, provided he was listening intently, but that he was unable to understand anything that was said; also that if there were the slightest noise in the room he was in, the listener failed to detect any sound from conversation on the other side of the panel. Attempts were also made to carry on a conversation through these panels by shouting. In this case one could always hear the other person, but as a rule failed to understand anything that was said. Compared with the walls in many apartments, this is a decided improvement. It should also be borne in mind that the rooms in which these tests were made had bare concrete walls and were so situated that no distracting noises entered from the outside. If they had been rooms in an ordinary apartment, where there were draperies and furniture to absorb part of the sound, and if there had been some noise due to traffic or other causes, the panels would have given still better results.

A very interesting illustration of the effect of absorbing material was found when a box was built and lined with some very absorbent material. There were some plate glass windows in the box, and when a person was on the inside his lips could be seen to move, but as a rule unless he raised his voice slightly no sound could be heard. The person on the inside, however, could hear every word said by anyone outside. A practical use of this might be made in offices where typewriter noises come through thin partitions and are annoying. If considerable material is placed in the room where the noise originates, it is sometimes possible to reduce the intensity to such an extent that the partition becomes satisfactory, and the noise is no longer disturbing. There is also a second advantage to use of such a treatment. The intensity of the noise being reduced makes the room much better for those working in it. Where tests have been made it has been found that this increases the efficiency of workers.

Up to the present we have considered only airborne noises. Noises due to impact form another class. They are among the most difficult to insulate, and are at the same time highly annoying. From experience we all know that a noisy machine often sounds almost as loud in the room below as in the room where it is located. To experiment with noises of this kind, a special machine (Fig. 2) has been built by the Bureau of Standards. It consists of a set of five rods which are raised in succession by a set of cams. The speed of the cams is such that one rod is allowed to fall every fifth of a second. On a wood floor it is quite noisy—sufficiently so that it is rather trying to hold a conversation with anyone in the same room. Where there were wood joists there was some reduction of the noise transmitted through the partition, but it was still decidedly annoying. Some contractors build a so-called "floating floor" by using a fiber board, and then laying the finish floor on top and nailing through the fiber boards. This form of construction was tested to determine if such a structure was an improvement, and somewhat to the experimenters' surprise (although the results might have been expected), the structure transmitted exactly the same percentage of sound within the limit of experimental error as did the

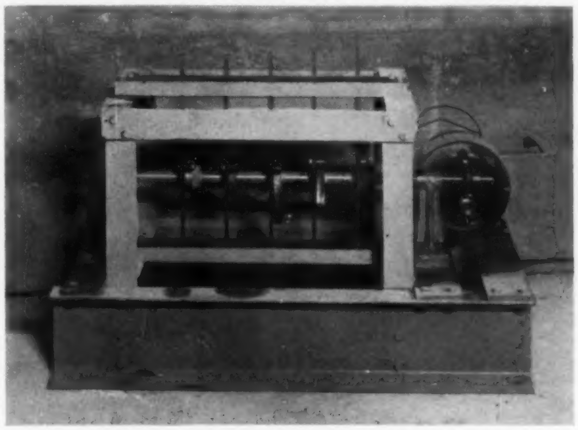


Fig. 2. Machine for Experimenting with Impact Noises.

structure before the fiber board was added. In other words, the vibrations were carried through the nails and destroyed any effect due to the fiber board. This applies to both air-borne and impact noises. In the next attempt a rough subflooring was laid and on top of this was placed fiber board, on which nailing strips were placed, and on this the finish floor. This will be referred to as a "floating floor." Details have not been worked out as to how these nailing strips should be fastened, but it is not believed that it will be difficult to do this and still preserve what sound insulation is gained. For air-borne noises, such a structure is quite satisfactory. Under usual conditions a conversation carried on in an ordinary tone of voice is not audible through it. For impact noises, however, the structure was rather disappointing. It was to some extent an improvement, but footsteps could be easily heard.

The next attempt was to separate the ceiling from the floor joists. This gave about the same results, although not quite as good as the single set of joists and floating floor. A floating floor was then added. This combination gave the best results that were obtained with wood joists and was very satisfactory as far as air-borne noises were concerned. It still needs improvement in regard to insulating against impact noises. In fact, at this point in the investigation the conclusion was almost reached that the most practicable way to prevent noise coming through from the floor above was to minimize the noise being produced. This can always be done by using carpets or rugs. Cork tile and rubber tile are also good, and even linoleum is much better than a bare wood floor. After considering this type of construction still further, it is hoped that possibly some type of double ceiling will help and that it will be possible to prevent ordinary impact noises from coming through and being annoying. Further work will be done along this line in the near future.

The other type of flooring which was studied was masonry. When impacts were allowed to fall directly on the masonry, the noise in the room below was practically as loud as in the room where the machine was situated. A floating floor was then added, with decided improvement. Finally a suspended ceiling was placed, and this gave the best results which have been obtained. For air-borne noises this is probably the best panel that has been tested. For one of the listening tests a radio loud speaker was used. The loud speaker was driven somewhat harder than is usually customary for home use, and even then when listening through the panel it was impossible to tell whether someone was talking over the radio or an orchestra playing. In fact it is doubtful whether a person could have been sure that the radio was going. It is certain that if the test had been made anywhere except in a room which was absolutely quiet, the radio could not have been heard. For impact noises it was not as good, but was quite an improvement. The noise from the impact machine was distinctly audible, but not loud enough to be readily noticeable if two people were talking in the room. A practical method of fastening the nailing strips remains to be worked out, as in the tests just described, they were simply laid on the fiber board. From some experiments on brick walls it is believed that these strips can be nailed or lagged to masonry at intervals so as to prevent their bowing up without affecting the sound insulation.

From all this it is evident that the best form of sound insulation for masonry which has been found would be constructed somewhat in this way. What might be called the "core" of the building would be built in the customary manner, that is, with the walls and floors of masonry. From this point the procedure would be different. Each room has been formed by this rough masonry, and inside of this the finished surfaces are to be built. Instead of plastering directly on the masonry to form the wall and ceiling surfaces, this part should be furred out so that the finished plaster surfaces are not in direct contact with the masonry. In the same way the floor should be of a floating type. In other words, we might picture it as a box within a box, the inner box being attached to the outer in as few places as possible, and these connections should not be any more rigid than is necessary. Exactly how these connections should be made to get the best results is rather a difficult matter to decide and needs more investigation.

For wood construction, the progress has not been as encouraging as for masonry. This is possibly due to the fact that sounds do not pass through most types of wood construction as easily as through masonry, and therefore the incentive for improvement has not been as great. Use of staggered studs and staggered floor and ceiling joists has been suggested as a good method of construction. The laboratory tests do show an improvement in such cases, but not as large as was expected; and it is a question whether the improvement is sufficient to justify the additional cost. Another method is to use fiber board bebetween the studs and lath. The improvement in this case was not as great as had been hoped for. Work is still being done along this line, and it is hoped that a satisfactory solution will be obtained which will not necessitate an expensive installation.

In all of the laboratory work done, one impor-

tant factor has had to be ignored, and that is water pipes, soil pipes, electric conduits, gas pipes, etc. All of these form excellent paths by which sound may travel, and they may frustrate all attempts at sound insulation unless care is taken to install them properly. One suggestion might be made about noisy water fixtures. To begin with, a fixture should be bought which is as quiet as possible. Even then fixtures are often noisy if the water pressure is quite high, and considerable energy has to be dissipated as the water flows through. This often sets the fixture and with it the pipe in vibration which can be heard in all of the adjoining rooms. It is practically impossible to insulate against such sounds, but it is relatively simple to prevent their being produced by installing a reducing valve where the water enters the house and reducing the pressure so that it shall not exceed say five pounds per square inch at the fixtures. To secure a good flow of water this necessitates a somewhat larger pipe than usual. Doors and other openings also present problems which have to be dealt with according to their individual cases. Ventilation pipes also present problems. One rather costly mistake in planning an apartment building came to the writer's attention. The bathrooms were built directly over one another. As there were no outside openings, the ventilation was taken care of by a shaft into which there was an opening from each bathroom. As a result, a person standing in one bathroom could hear everything that went on in all of the other bathrooms, since the ventilating shaft acted as a speaking tube. As a result of this the owner was unable to keep tenants in the apartments, and he has spent several thousand dollars trying to remedy this faulty construction, but with only partial success.

The foregoing is intended to be only a brief outline of the work that has been done on sound insulation and to suggest some of the things that are to be avoided. It is not felt that this article would be complete unless a brief reference were made to results of laboratory tests which have been published. Unfortunately, these figures do not give absolute results, such as can be obtained for heat insulation, but depend on the manner in which the measurements were taken and also to some extent on the rooms in which the measurements were taken. For this reason it is rather difficult to compare results made by different observers. If comparisons are to be made between different panels, it is rather desirable that all of the results to be compared should be made by the same observer. It is also desirable to call attention to the form in which the results should be published. Most of the laboratory measurements on sound transmission are made by using a telephone or microphone to pick up the sound energy which is to be measured. These instruments measure sound on what we shall call the "physical" scale. But the most universally used instrument for detecting sound and estimating its intensity is the ear, and unfortunately the ear scale is not the same as the physical scale. As the intensity of sound increases steadily on the physical scale, the response of the ear fails to keep pace with the increasing energy of the sound waves, but is in fact proportional to the logarithm of that intensity. For example, two sounds of intensity, 10 and 100, as measured on the physical scale, would seem to the ear to have the ratio of 1 to 2, the common logarithms of 10 and 100. And because of the almost universal use of the ear as a means of detecting sound, it is advisable to express the results of the experiment on the ear scale.

This method of expressing results presents some difficulties. While the relative sound transmission of two panels is always the same on the physical scale, no matter how loud the sound which seeks transmission, this is apparently not the case on the ear scale. A numerical example, given in this table, will illustrate this point. We consider two walls, A and B, of which A transmits 1/1000 and B 1/100 of the incident sound energy, measured on the physical scale:

Intensity of Sound on Far Side of Wall: Physical Scale	Wall	Intensity of Sound Transmitted: Physical Scale	Ear Scale
1,000,000	A	1,000	3 (=log. 1,000)
	B	10,000	4 (=log. 10,000)
10,000	A	10	1 (=log. 10)
	B	100	2 (=log. 100)

From this it may be seen that while A is 10 times as good as B (in the physical scale), no matter what the original intensity of the sound may be, the ear estimates A as twice as good as B for a faint sound, and both A and B as nearly the same (ratio 4/3) for a louder sound.

We should therefore be cautious about the use of such phrases as "twice as good a sound insulator"; the point that should be emphasized (in advertising or otherwise) is not whether one material is twice as good as another under some special condition but whether it gives sufficient sound insulation under conditions as are usually prevailing to reduce the sound to a point where it will not be annoying. This means that to make a satisfactory installation one should know approximately the intensity of the noise he is trying to insulate against and approximately how good a sound insulator is the type of structure that he proposes to build. It is hoped that these suggestions will be of benefit, and that they will aid in the building of better apartment houses.

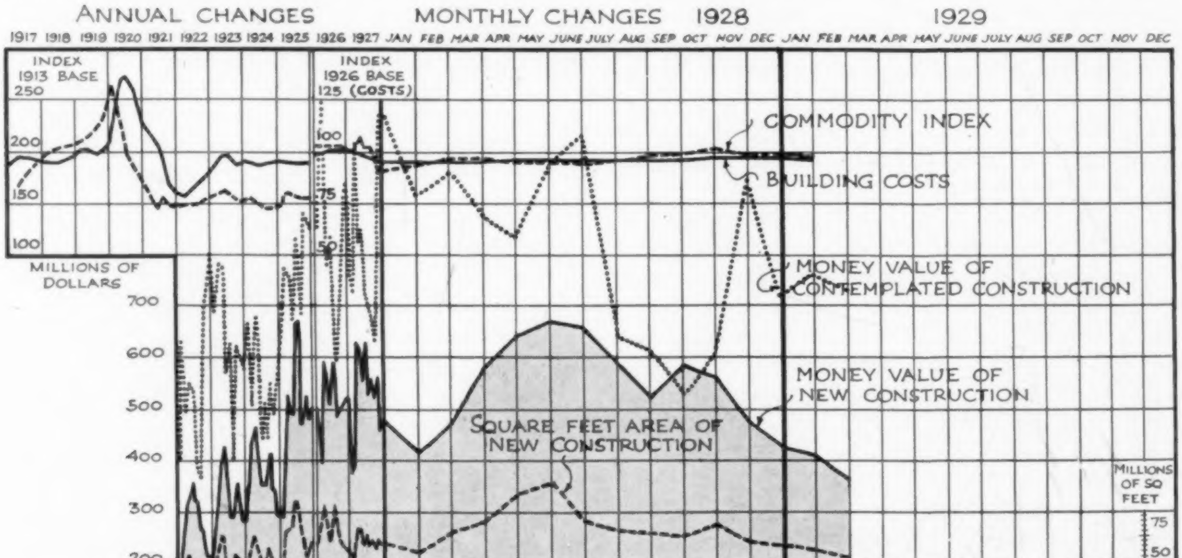
THE BUILDING SITUATION

A MONTHLY REVIEW OF COSTS AND CONDITIONS

FEBRUARY construction contracts awarded in the 37 states east of the Rocky Mountains show a 12 per cent decline from January of this year and a 22 per cent decline from February, 1928, according to figures provided by the F. W. Dodge Corporation. The total valuation of this February construction,—$361,273,900,—covers a period of four days less than the January totals, but there seems to have been approximately the same daily construction volume as that existing since the beginning of 1929. Combining the figures for January and February, 1929 gives a total of $771,241,800 and represents a decrease of 14 per cent from the 1928 construction for that period.

The district consisting of New York state and northern New Jersey, with a February total of $74,985,900, showed a falling off of 26 per cent from January of this year and 46 per cent from February, 1928. In the central west the total construction for February of $99,321,000, here again, was below the figure of the previous month by 12 per cent and below that of February, 1928 by 35 per cent. The only other district which showed a decrease for February, 1929 was that including the southeastern states, which had a total of $34,266,700, which is 12 per cent below the figures for February, 1928, and 9 per cent below the January, 1929 total. In the New England states construction was the highest ever recorded for this month. The total for the month of February was $26,430,700.

In the middle Atlantic states the value of construction started during February amounted to $50,689,700, an increase of 3 per cent over that of the preceding month and 9 per cent above the total for February, 1928. The Pittsburgh district showed an increase of 22 per cent over February, 1928, but its total of $50,298,500 was 12 per cent below the figures for January, 1929. This same condition existed in the northwestern states where the February contracts, $3,746,500, were 70 per cent higher than for February, 1928, but 40 per cent below the January, 1929 figure. The February contract total for the 37 states show that 36 per cent of all construction represented residential buildings, 19 per cent commercial buildings, 16 per cent public works and utilities, and 16 per cent industrial projects. Contemplated projects reported during February reached the total of $772,621,600 for the 37 states. This is 6 per cent less than the amount of contemplated work reported during January of this year and 18 per cent less than that reported for month of February, 1928.



THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs.* This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index.* Index figure determined by the United States Department of Labor. (3) *Money Value of Contemplated Construction.* Value of building for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Corp. and *Engineering News-Record.* (4) *Money Value of New Construction.* Total valuation of all contracts actually let. The dollar scale is at the left of the chart in millions. (5) *Square Foot Area of New Construction.* The measured volume of new buildings. The square foot measure is at the right of the chart. The variation of distances between the value and volume lines represents a square foot cost which is determined, first by the trend of building costs, and second, by the quality of construction.

THE SUPERVISION OF CONSTRUCTION OPERATIONS

BY

WILFRED W. BEACH

THE FIRST DAY ON THE JOB—*(Continued)*

Editor's Note. Mr. Beach here continues the consideration of "The First Day on the Job," Chapter 4 of which appeared in the February issue of THE ARCHITECTURAL FORUM.

Regarding saving by the waiving of a bond, the architect was known to be greatly in favor of so doing, as he regarded the unnecessary addition of 1½ per cent to the cost of a building to be quite unwarranted, except only as a pure matter of insurance. If it had been a private owner, the superintendent was quite sure that, with such a high class contractor, the architect would approve the saving, but, this being public work, the question was entirely one for the board to decide. It was obvious that the architect could not in any way be held for any of the contractor's defections, although the architect and superintendent would do their best to see that the contractor fulfilled the terms of his contract and met all his obligations pertaining thereto. It was thereupon decided that if a surety company could be found that would underwrite the architect's form of bond, such bond would be accepted; otherwise the board would consider doing without one. The agent was persuaded to send a night letter to his company, with the result that a bond in acceptable form was promptly forthcoming and all was well in that particular.

Returning to the site after lunch, the contractor was found directing his new foreman, starting work on temporary buildings, but it was apparent that neither had thought to consult the specifications on the subject:

"TEMPORARY OFFICE BUILDING. The Contractor shall, immediately after award of contract, provide a substantial, weatherproof building at the site, containing an office for the Superintendent, of at least 120 sq. ft. of floor area and fitted with movable sash on each open side, substantial door (with butts, latch and cylinder lock), table for blueprints, desk with drawers, locker, stool and two chairs, all as directed by the Superintendent and at the expense of the Contractor, who shall provide heat and light for same.

"CONTRACTOR'S OFFICE at the site shall be a substantial, weatherproof building, properly heated and lighted and appropriately furnished. It may be under same roof with Superintendent's office, with partition separating. The Contractor's office shall be the proper place of deposit for all copies of all drawings and specifications and for all his file records pertaining to the work. It shall also be the proper place for delivery of all orders and instructions to the Contractor. The Contractor or his Foreman shall be constantly in charge of same during working hours and shall maintain (on shelf accessible to the Superintendent) a telephone, served and listed by the local exchange, all at the Contractor's expense. Free use of the telephone shall be granted to Representatives of Contractors, Subcontractors, Owner and Architect, except that the Contractor may require reimbursement for tolls on long distance calls. He may also have a pay telephone installed for the use of others. The Contractor's office shall not be used for the storage of equipment or materials nor as a loafing place.

"MATERIAL SHEDS. The Contractor shall provide at least 3 shelter sheds where directed, separate or under one roof, each containing 260 sq. ft. (or more) of floor area, and of substantial weatherproof construction, with hinged door to each shed, and a window on each exposed side. Each door shall be fitted with hasp and staple and brass padlock with necessary keys. The Superintendent will assign space in these sheds according to his best judgment.

"TOILET CONVENIENCES for all persons employed on the work shall be constructed and maintained by the Contractor in accordance with City ordinance and State laws, properly lighted and heated and kept clean and sanitary, satisfactory to Superintendent and local Authorities."

Being set right on these subjects, the contractor and his foreman next proceeded to "stake out" the building in accordance with the plot plan, erecting substantial batterboards at each of the four corners. Fig. 7 illustrates the customary and proper manner of setting batterboards, which should be located far enough back of the edge of the excavation to be out of the way of teams and trucks. The boards are nailed to substantial stakes driven well into the ground and notches are cut in the upper edges as shown. "C" and "H" are on lines of outside surfaces of basement walls; "B" and "I" mark the inside surfaces; "A" and "D," and "G" and "J" are the outside lines of the footings; and "E" and "F" are the limiting lines of the excavation. Cords stretched from these notches to corresponding notches in boards at opposite corners afford lines from which a plumb-bob can be dropped and lines or points in the excavated portion be correctly located. Thus, plumbing down from intersection at point "L," the contractor locates the corner of his excavation at "K." If it is desired to prove the square of the corner at "L," one can use the simple rule of "the square of the hypotenuse is equal to the sum of the squares of the other two sides of a right-angled triangle," measuring 40

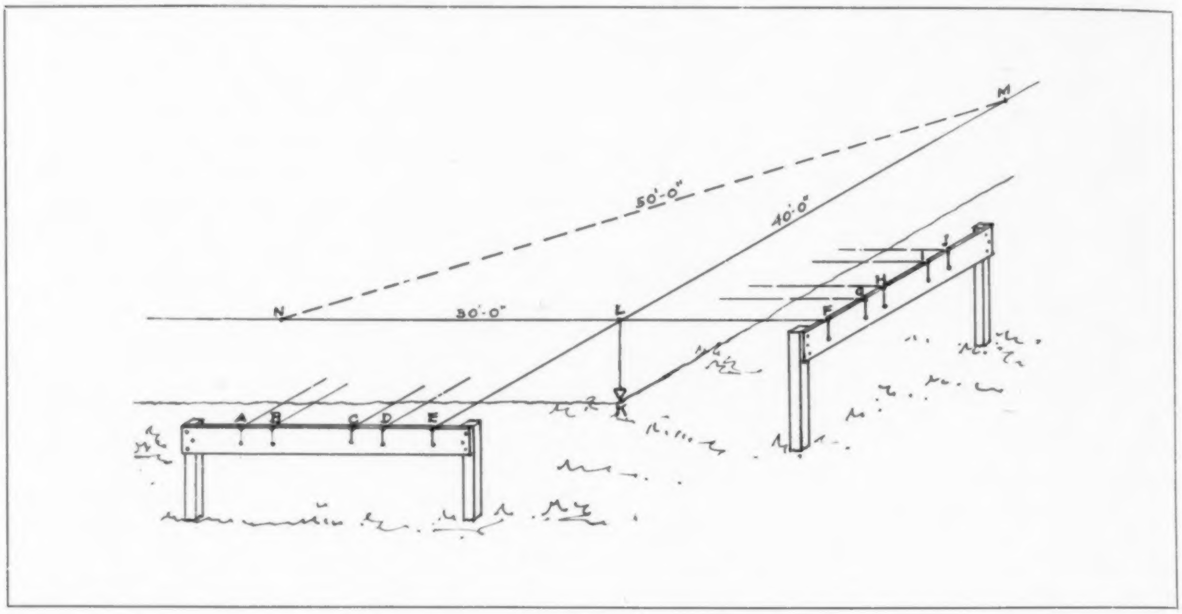


Fig. 7. A Proper Arrangement for Setting Batterboards

feet in one direction from the corner, 30 feet in the other direction and 50 feet across the hypotenuse. This should be done with great care, as the variation should not be more than ½ inch in 100 feet.

Here is the superintendent's report of the first day's activities at the site:—

Work day:—No. 1.
Force worked:—10 hours.
Weather conditions:—Finest.
Temperature:—78° to 82°.
Number and kind of workmen employed:—
General Contractor:—6 carpenters and 1 foreman.
Excavating Contractor:—6 men with teams, 1 foreman, 1 steam shovel man.

Work today consisted of:—Taking out trees and shrubs; protecting trees and walks; starting stripping loam; bringing on steam shovel; starting to stake out the building and put up sheds.

Cause of delays, if any:—Contractor submitted bond on bond company's printed form which was rejected. He was notified he could continue work as trespasser until bond is settled. He is proceeding with that understanding. Board is to meet tonight to consider subject.

Drawings and information needed:—Contractor needs two complete sets of working drawings at once; one on cloth.

Daily letter:—Job started 2 days ahead of schedule without authority, but weather too fine to stop it. Contractor's liability insurance policy is No. 283,576 in . . . . Co. Grading subcontractor was ordered to get policy at once; promised for tomorrow. Job telephone, electric and water supply ordered in. Permit applied for; said to be a matter of form on public buildings.

To this, the superintendent added his room address for regular mail and the address of the job for receiving telegrams and special delivery letters.

CHAPTER 5
BEGINNING THE WORK

AFTER the first day's preliminaries at the site, the morning of the second day proved a busy time for the superintendent. First, he found that the subcontractor for grading had changed his mind about getting a liability insurance policy, —simply refused to do so, intimating that he considered the demand for it to be only attempted graft on the part of the member of the board of education who was agent for such insurance. He claimed further that the law did not require such insurance to be carried by employers who were financially responsible. To this the superintendent rejoined that it was not a question of law but of contract requirements, and that the policy must be forthcoming, quite regardless of who might be the agent. Here appeared the chairman of the building committee of the board, accompanied by the principal of the high school. This board member and the general contractor added the weight of their counsel to that of the superintendent, as a result of which the grading contractor finally agreed to secure a policy from an-

other agent, and a copy of the application was handed the superintendent a little later in the day.

In discussing the work with the board member and high school principal, two matters of vital importance developed. One was that the school man had been delegated by the board to act as its representative on matters pertaining to the new building during intervals between board meetings; the other, that another board member, who was also a member of the town planning commission, had an idea that the building, located on a hillside with a fine prospect to the south, would look better and have a still finer view if raised about 3 feet higher than shown by the drawings. Decision on this was deferred, pending the next visit of the architect, due the following Monday, but the other matter was not one that could be either deferred or disposed of. The intervention of such an "agent" in building programs is not unusual and is a fruitful source of friction in too many instances. In the case of private work or that of a corporation, the agent is frequently looking more to his own interests than to those he represents, as a result of which the superintendent finds him presently aligned with one or more of the contractors to the detriment of the work. Even on public work, the agent, with no apparently dishonest intent, may be heard criticizing the architect and his documents as much as he does the performance of the various contractors. His relation to the work is only semi-official, with no definite limitations and, unless he is a very unusual individual, he is much more of a nuisance than a help. Having no real authority, it is nevertheless difficult for him to avoid assuming the semblance of it, especially if he be, as in this case, a school official accustomed to dictating to his subordinates. It is difficult to understand why, after employing an architect to conduct their operations, owners should consider it necessary to inject a personality whose very employment means merely an added problem to be dealt with. If a superintendent is compelled to face it, he had best "cultivate" the incumbent and trust that he will not prove a deliberate trouble maker.

This man had started being officious the preceding day, before the arrival of the superintendent, by directing the grader to have the slip-scrapers dump the top soil into a small ravine that required filling. This error was corrected, and the loam was ordered piled on high ground where it would be subject to minimum wash from storm water, as provided in the specifications:

"TOP SOIL. At beginning of excavating, the black earth at surface shall be removed to a depth of 9″ to 12″ over the building site and piled on premises where directed by the Superintendent, to be distributed as required before completion of the work."

Neither the school man nor the grader had thought to consult the specifications on such a minor matter, but the incident was of value as initial proof that there should be but one head to the work.

The superintendent and the principal also reviewed other specification paragraphs especially applicable at the beginning of the work:

"PERMITS for building construction, street obstruction and water connection shall be taken out by the Contractor before operations are started. He shall pay all fees for same, including inspection fees and cost of all water used for the work of others, as well as for his own operations."

"PROGRESS PHOTOGRAPHS shall be taken by a professional photographer at the expense of the Contractor at intervals designated by the Architect, 12 negatives in all, on 8″ x 10″ plates. Three prints from each negative, mounted on linen with binding margins, together with the negative, shall be delivered promptly to the Superintendent by the Contractor, in each case."

"LINES AND LEVELS. The Owner will have lot lines and restrictions established and a copy of survey provided on which same are indicated, also stakes and marks evidencing same, together with a permanent bench mark conveniently located. The responsibility for all other lines and levels necessary for proper location and erection of the building and appurtenances rests with the Contractor who shall employ a competent instrument man."

"USE OF PREMISES. (From Art. 42 of A. I. A. General Conditions.) The Contractor shall confine his apparatus, the storage of his materials and the operations of his workmen to limits indicated by law, ordinances, permits or directions of the Architect and shall not unreasonably encumber the premises with his materials."

"PROPERTY CONFINES. The Contractor shall limit the storage of his materials and the operations of his employes as prescribed in Art. 42 of the General Conditions and shall not infringe upon storage and operating space assigned to others. The Contractor has no authority to permit the use of any portion of the premises by anyone, except for business connected with the construction in which this contract is concerned."

"EXCAVATING IN GENERAL. The Contractor shall provide all excavating for basement, areas, etc., all to the various depths required. Hand excavating for pits and footing

trenches is included with foundation work. Excavations shall extend 2′ 0″ outside of all basement wall planes and to 9″ below finished planes of various basement floor levels. Work shall start at one end of the building, as directed by the Superintendent, and shall proceed uniformly to the opposite end, completing as it progresses, so that the first end can be turned over to concrete workers without waiting for entire excavating to be completed. The work shall be so laid out and conducted as to produce no conflict between concrete workers, trench diggers and those working on remaining excavating."

Taking stock of these matters in the order quoted, the superintendent learned that application had been made for a building permit and that a set of prints had been filed with the local building department, that the issuance of a permit in due time was to be expected as a matter of course, but that nothing had been done about water supply or the first progress photograph. He insisted that the contractor give these subjects immediate attention and that he also arrange at once for the requisite telephone service.

The foreman and an assistant were continuing the work of staking out the building, the former making use of a surveying instrument. The contractor satisfied the superintendent that he, the foreman, could qualify as the "competent instrument man" demanded by the specifications. The superintendent later verified this, as well as the accuracy of the instrument and the work done by it.

Meanwhile, a carload of cement had arrived on the tracks, and the contractor was anxious to unload it, to avoid paying demurrage. He asked permission to have it stacked on the shed floor and have it covered with tarpaulins. Reference was made to the specifications, wherein clauses were found pertinent:

"ALL CEMENT, except where otherwise specifically stated, shall be approved Portland, properly tested before using. It shall conform in all particulars to the latest standards and tests of the American Society for Testing Materials. Samples shall be taken as directed. Each car lot shall be stored separately and plainly marked for identification.

"Cement shall be stored in the water- and weather-proof shed, provided by the Contractor (as elsewhere specified), with floor well up from the ground. None may be used that has been exposed to weather nor from bags showing water marks or caking."

The contractor, in view of these restrictions, was directed to leave the cement on the tracks while the shed was rushed to completion. Four samples were taken from the car lot and sent to the architect's office for testing, the brand being one known to be acceptable to him. The manufacture of Portland cement has reached such a degree of standardization and excellence that metropolitan architects and contractors seldom have cause to reject more than an occasional sack that has met with accident. Cement for use in cities is always subject to testing, and hence it is safest and most economical for the manufacturers of this commodity to ship none that might fail to meet requirements. This is not so in rural districts, where most of the cement sold (other than that shipped in car lots for road work or large buildings) is first stored in lumber yards, then distributed in small parcels to local builders who have no desire to test and no convenient facilities for so doing. Such cement should be carefully watched, as it is not unusual for it to fail under test. It may have been originally bought at a bargain because of its inferiority. There is always a chance that a country dealer will try to unload some of it on such work as this school, in a real or pretended emergency, hence the wide awake superintendent will keep an eye on it and should warn both the dealer and contractor that no such old or stored cement is to be used under any circumstances; and it would therefore be expedient for the dealer to make sure that he has enough of the right material on hand at all times.

The location of sheds and the dumping of top soil led to a general discussion of the contractor's yard layout. Together, he and the superintendent evolved a working plan for all temporary storage and facilities, as shown by the plot plan, Fig. 8. The superintendent's interest in this phase of the work has to do only with seeing that provision is made for storage space for minor contractors' materials, and that temporary buildings and heavy materials are not so placed as to be in the way of trenching for sewer and other piping. In this case, the available space was ample for all purposes, but in a more confined location, considerable ingenuity must be exercised in designing a temporary layout of maximum efficiency and in avoiding friction between all contractors demanding accommodation. It will be noted that this contractor arranged to have his sand and gravel dumped on the paving, to avoid the expense of building a floor, as would have been his alternative under the specifications. Materials to be first used from storage piles, such as floor tile and common brick, were piled as close in as possible. Floor tile (for first floor only) would be all used before the hoist would be placed in service. Thereafter, brick and wall tile, in limited quantities, could be unloaded close to the hoist.

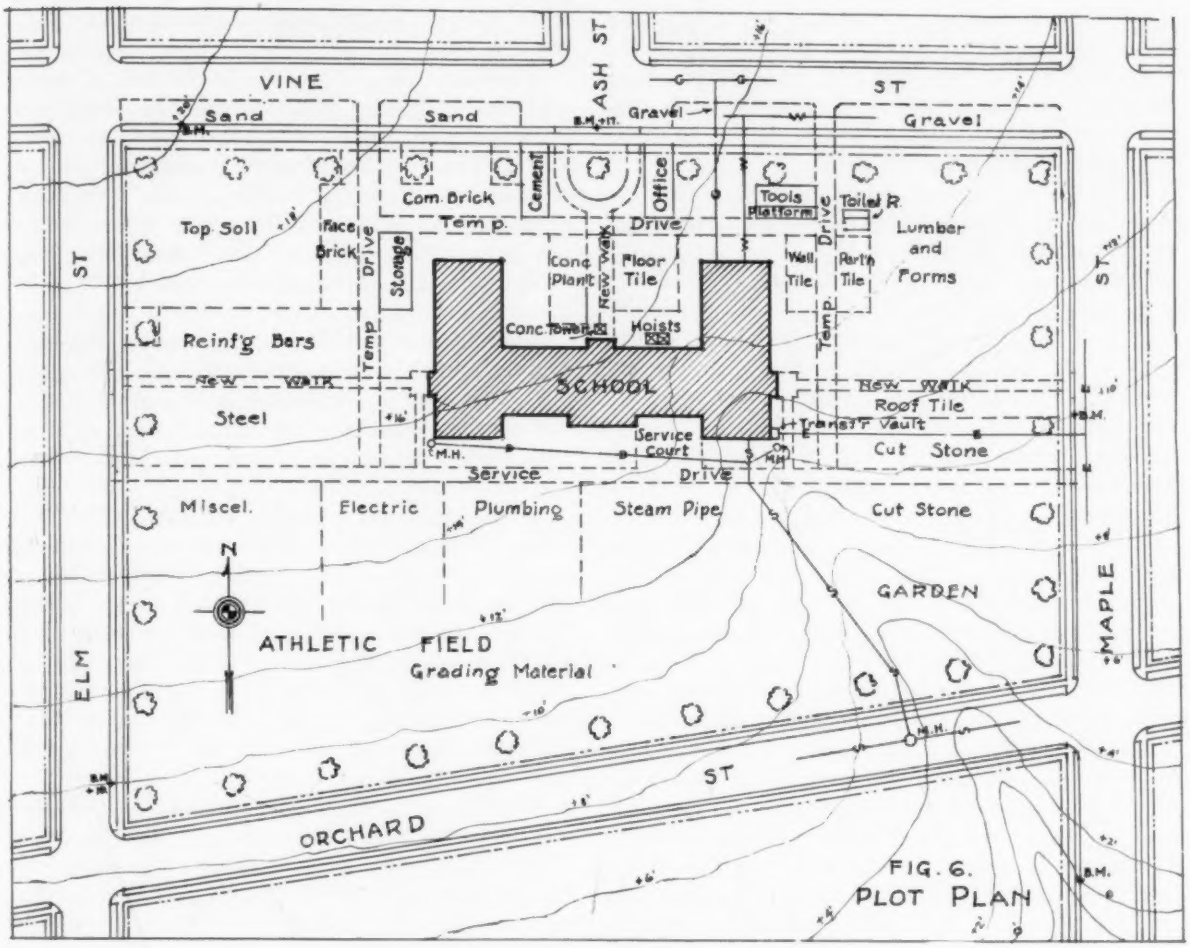


Fig. 8. Plot Plan Showing Disposition of Building Materials on the Site

Larger areas were allotted to items requiring sorting and re-handling, such as lumber, cut stone and reinforcing bars. Temporary drives were combined with the future service driveway to afford maximum communication at minimum distance, inasmuch as these roadways had to be maintained for several months and might be very muddy at times. For this latter reason, the contractor was given permission to start hauling cinders for use as temporary paving for these drives with the understanding that such cinders as were still in fit condition could later be used as underbed for walks and permanent driveway.

In the afternoon of this second day, the contractor suggested a trip to the gravel pit from which he expected to secure both sand and gravel, using the latter "pit-run." In fact, he admitted having gambled on such intent and had reduced his bid several hundred dollars on the chance. Before leaving the premises, the superintendent wrote an order to the contractor to hold his excavating 3 feet higher than shown on drawings, pending arrival of the architect and his decision on the proposed change in the building grade. The necessary instructions on this subject were passed on to the grading contractor who was also informed as to the proper amount of material to be left on the premises for finished grading. Enough stripping of top soil had been done for the steam shovel to get into action, hence it and the auto trucks were already working to capacity.

En route to the gravel pit, the superintendent consulted his specifications and re-read the paragraphs on the subject of aggregates:

"SAND. Fine aggregate shall consist of sand having hard, durable grains, free from injurious amounts of dust, lumps, soft or flaky particles, shale, alkali, organic matter, loam or other deleterious substances. It shall be well graded in size up to 1/4"."

"COARSE AGGREGATE shall consist of crushed rock or gravel having clean, hard, strong, durable particles, free from injurious amounts of soft, friable, thin, elongated or laminated pieces, alkali, organic or other deleterious matter. It shall be well graded from 1/4" to 3/4" for fine concrete and from 1/4" to 2" for mass concrete. If gravel is used, it shall be screened to size and

washed if, in the opinion of the Architect, such treatment is indicated." "Occasional pieces larger than 2" will be permitted in mass concrete, provided that same are entirely embedded in wet concrete and have no surface closer than 6" to outside plane of the mass."

"STORAGE. Sand, stone and gravel shall be deposited only on paving or suitable planking; never on bare ground."

The pit was found to be one long disused and recently re-opened, evidently for this particular work. The stripping had disclosed a good bed of gravel lying between the surface stratum and one of fine sand. Both stand and gravel appeared to be of good quality. The chief difficulty was evidently going to be the task of keeping the fine and coarser aggregates separate and at the same time free from droppings and wash from the overlying earth. This latter, the contractor proposed to effect by using hand excavating for the gravel and following with a steam shovel and a portable sifting plant that would deliver sand of proper fineness. The stripping was to be kept well back from the pit, and proper watersheds maintained to fend off storm water. The superintendent appreciated the contractor's effort to hold down costs and expressed himself as being quite willing to coöperate wherever possible, keeping always within the intent of the contract. If pit-run gravel of suitable character could be delivered at the building site at a cost of about $1.75 a yard, and the sorted material at an additional 50 cents, the contractor would be sufficiently under the local price of $4 a yard for crushed rock to have justified his gamble. The gravel would probably contain too high a percentage of sand, the which could be equalized, as he explained, by the admixture of the indicated amount of coarser material.

It is evident that the superintendent was going out of his way to help the contractor and equally evident that he was running the risk of making later trouble for himself by the necessity of closely watching the ratios of sand and gravel. It would have been much easier and safer for him to have pointed out the advisability of having a washing and grading plant installed before beginning to haul material from the pit, but this would have raised the cost of coarse aggregate to about that of the crushed rock. It is likely that the more cautious course would have been that adopted by the majority of superintendents of experience, but this man was imbued with the idea that, if he would go somewhat out of his way in the matter of coöperating with the contractor at this stage of the work, he would find himself repaid later on; so he tacitly approved the contractor's arrangements and took samples of the sand and gravel and expressed them to the home office.

The two then drove to a brickyard to inspect common brick and partition tile for which contract had been made, subject to approval. They found three grades of each, separately piled,—"kiln-runs," "selects" and "culls." Another grade, termed "standards," was not shown. In this grade, only the very poorest and softest had been culled out. The superintendent was told that the material used by local contractors was generally "kiln-run," but that it was then being culled to comply with his strict specifications. The superintendent gave provisional approval of the selects but cautioned the contractor that such approval was made conditional by this paragraph of the specifications:

"'APPROVAL' AND 'ACCEPTANCE' in these specifications, unless otherwise stated, mean approval and acceptance by the Architect; but no acceptance by the Architect shall bind the Owner in case of proven defective work or other clear violation of the contract; nor will approval of material or equipment before same is brought on the premises be held to constitute acceptance, in case such items are found not to comply with specification."

Three samples showing the range of select common brick were also sent to the express office. The next stop was at the lumber yard, merely, as the contractor explained, "to get acquainted." The fact that the lumber dealer was also a member of the board of education appeared to embarrass him not at all as a purveyor of materials to the school building. Both he and the contractor showed considerable surprise, however, when the superintendent expressed a desire to see the stock of No. 1 white pine lath. They thought he was looking a long way ahead. This was admitted, and the stock of various grades of lath inspected. The best grade showed signs of having been on hand a long time, which was explained by there being but little call for it, contractors generally saving the few dollars per thousand difference in price by ordering the cheaper grades (perhaps claiming that the No. 1 grade was not to be had) The superintendent suggested that such extremity be avoided on the school work by ordering well in advance, which the contractor agreed to do, receiving a further hint to the effect that this architect considered metal lath to be the only adequate substitute for No. 1 white pine.

Inspection of wood lath is always a matter for the close scrutiny of the superintendent, when they are called for. No. 1 white pine lath are generally specified by architects where wood lath are indicated, because of the impression that no other wood can back a good plaster surface quite

so well. Obviously, this grade is only carried in yards where the demand warrants buying full car lots, or where possible, part loads of "mixed" cars. Contractors and supply dealers will seemingly exert themselves more to substitute something else for these lath than to effect any other evasion of a given contract. Usually the lath is not delivered until the lathers are on hand to apply it, and the inspector must then either compromise or delay the work. Hence our introduction of the subject thus early in the procedure.

Many instances could be cited to indicate how far contractors and dealers will go in their endeavors to evade the exactions of a No. 1 white pine lath specification. In one such case, a young clerk-of-the-works was induced to pass a carload of other lath because the No. 1 white pine "was not to be had in that market." But that market happened to be in the Black Hills, where such lath are a local product, hence the members of the building committee were up in arms when they saw the lath from outside being unloaded, and wired the architect to set the matter right. This he did by dismissing the superintendent and taking advantage of the specification clause which permitted the owner to refuse "accepted" material that was manifestly not up to requirements.

Another instance was that of a bank building being constructed under a "cost-plus" contract. The builder had purchased his lath as part of his lumber bill from a dealer who happened to be a director in the bank. Three months later, when ready for the lath (this was in 1920, when prices were advancing by leaps and bounds), the builder was informed that he would have to use a cheaper grade, as the No. 1 were not to be had for less than $18 per M. To this the builder demurred as he had bought them for $8.50 per M. But the dealer naïvely contended that he could not be expected to store them indefinitely at the price quoted. So the builder offered to pay storage, but found that the dealer had sold the lath to others at a fat second profit. Later, in the absence of the builder, the dealer told the other directors about the dilemma, omitting to mention that the lath had really been ordered and sold at the lower price. He insisted that he would not cut his prices to favor an "outsider" but, to accommodate his bank, would deliver the lath for $15 per M., if the order were signed then and there, ahead of another threatened rise, which was done. The dealer said nothing further of the matter until the time of final reckoning, when it amused him to divulge the particulars of the deal.

It developed on the school project with which we are dealing that our forehanded superintendent "started something." An immense amount of gossip anent an outstanding construction operation in a small place circulates continually during its progress. It is malicious, disinterested or merely critical,—according to the animus or interest of the vender,—but seldom helpful. Here we may record an accidental exception. The architect had specified tile partitions in the basement and tile or gypsum block (at contractor's option) above the basement, except for certain minor partitions, for which metal-lath-and-plaster, 2 inches thick, was called for. The architect's instructions from the board were to produce a building of the requisite size and appointments, as nearly fireproof as the appropriation would permit. But, as is not unusual, it developed that the requirements far outran the limits of the appropriation; hence, in order to reconcile the two, he had asked the bidders for three major alternatives:

1. The saving to be affected by substituting light-weight steel beams or trussed-metal joists for flat-tile-arch-and-concrete-joist floor construction.

2. The saving to be made by substituting wood rafters and sheathing on steel framing for the concrete roof construction.

3. The having to be made by substituting wood lath and studding for tile-and-metal-lath partitions throughout the building above basement.

The contract had been awarded on the basis of all three savings, except that trussed-metal-joist construction was adopted only for the second and third floors, and not for the first. However, so much criticism was suddenly aroused because of the idea that a building originally intended to be approximately fireproof was falling too far short of the intent if stud partitions were used, that the board members hastily decided to reconsider the third alternative. Hence this subject, and also the question of raising the grade at the building, were made causes of the calling of a special meeting of the board on the afternoon of the day of the architect's visit.

The first work day under the schedule found the job well organized. Trees and walks had been duly protected; scrapers were busily piling the top soil; the steam shovel and its covey of motor-driven dump carts were in systematic action; carpenters were completing the cement shed and starting the office building; and the photographer was on hand to take the first photograph. Inasmuch as 12 of these were included in the contract, it was assumed that only one exposure per month was expected, and therefore the viewpoint was carefully chosen by the superintendent to afford maximum information regarding the activities in progress at each period. The superintendent also intended to make use, from time to time, of his own small camera for such snapshots as would serve to record particular conditions and

illustrate the points discussed in his daily reports.

The end of the first week recorded five and one half work days of excellent progress. Stripping of top soil had been completed, and the excavating was well under way. A concrete plant was being installed at the upper end of the site, and the carload of cement had been stacked in the nearby shed, which was being covered with 1-ply, hard-surfaced roofing felt. The office building was being similarly completed, and a shed was being erected for the shelter of workmen and their tools; a fourth shed had been decided upon by the contractor, for the use of subcontractors, in preference to permitting them to share the space in his tool shed. Another crew of carpenters was constructing forms of a standard size for use in building the basement walls. Two crews of linemen were running wires for telephone and electric supply. The water main had been tapped, and a ¾-inch supply was being run on top of the ground to a point near the concrete plant. Several loads of pit-run gravel had been dumped on the paving above the concrete plant, and the delivery of this material was going forward rapidly, but no sand or graded coarse aggregate had come from the pit. A carload of reinforcing bars had been unloaded in the space assigned for their sorting and storage.

Saturday, weather being fair, the excavating machine and dump trucks continued in operation throughout the afternoon, the other trades "knocking off" at noon. When the shovel reached the level where the contractor had been told to stop, 3 feet above that orginially intended, the shovel man advanced the claim that he would lose money if his machine could not work continuously. This the superintendent admitted, but pointed out that he was merely working overtime to his own advantage, and that the status of the work at Saturday noon was supposed to be identical with that at the beginning of work on Monday morning, when the architect would be on hand to render a decision. The shovel man thereupon continued as directed without further argument, admitting that the remaining three hours would not make much difference.

Before leaving the site that night, the superintendent saw to it that a small diverting trench for storm water was dug in the sod above the excavation. He also inspected the cement shed and found that the carpenters had left without completing the waterproof covering. In spite of the fine weather, he insisted that the covering be completed. This was attended to personally by the general foreman and carpenter foreman. It was well that they did, for a severe storm of rain and wind occurred on Sunday and continued throughout the night and until Monday noon. On Sunday afternoon the architect was advised by telephone to defer his visit until Tuesday, which he did. Meanwhile, stock was taken of the damage done at the site. Fortunately, it was not serious. The cement shed proved tight, but the diverting ditch had been insufficient for the purpose, and the excavation was a sad mudhole. A controversy arose between the general foreman (his employer being absent) and the excavating contractor as to who should provide a power pump. The excavator claimed he had figured only on excavating,—was not in the pumping business. The foreman contended that the subcontract had been awarded for the excavating as specified, to which the other rejoined that he had bid "on the plans" and hadn't seen the specifications.

Both parties had already learned to respect the judgment of the superintendent, but he insisted that it "wasn't his funeral" and referred them to the specification clause directly applicable:

"SPECIFICATION DIVISIONS. For convenience of reference, this specification is divided into various headings and subheadings, but such divisions do not make the Owner or Architect responsible for the limitations of the contract of any subcontractor, each of which contracts shall be dependent upon its own definite confines, regardless of specification divisions."

Many metropolitan architects omit this clause from their specifications and insist that their divisions *do* govern the limitations of a contractor's understandings with his "subs," but it is a custom full of inconsistencies and fraught with much danger. In this case, it would have made an issue out of a matter which was merely a cause of argument. To settle it, the superintendent cited the two paragraphs in the specifications applicable. Under "Supplementary General Conditions," he found:

"STORM WATER and water from springs and pipe leaks shall not be allowed to stand in the excavations or basement or other parts of the building, but shall be adequately guarded against by ditching, draining, pumping or other approved means."

And, under "Excavating":

"PUMPING. All parts of the excavations shall be kept free from standing water from any source (as specified under Supplementary General Conditions), for which purpose the Contractor shall provide hand or power pumps of needed capacity until drainage connection to sewer is made available."

(*To be continued in the May, 1929 issue of* THE ARCHITECTURAL FORUM.)